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North Carolina Department of Transportation
Statewide Planning Branch
Small Urban Planning Unit

Surry County Thoroughfare Plan

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Thoroughfare Plan for Surry County, North Carolina

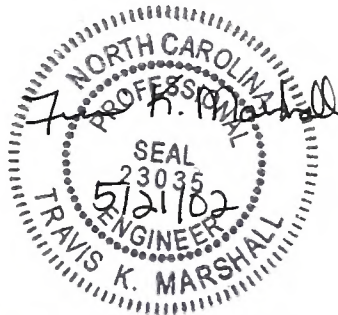
Prepared by:

Statewide Planning Branch
Division of Highways
North Carolina Department of Transportation

In cooperation with:

Surry County
The Federal Highway Administration
The United States Department of Transportation

April, 2002



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GEOGRAPHIC LOCATION FOR SURRY COUNTY NORTH CAROLINA

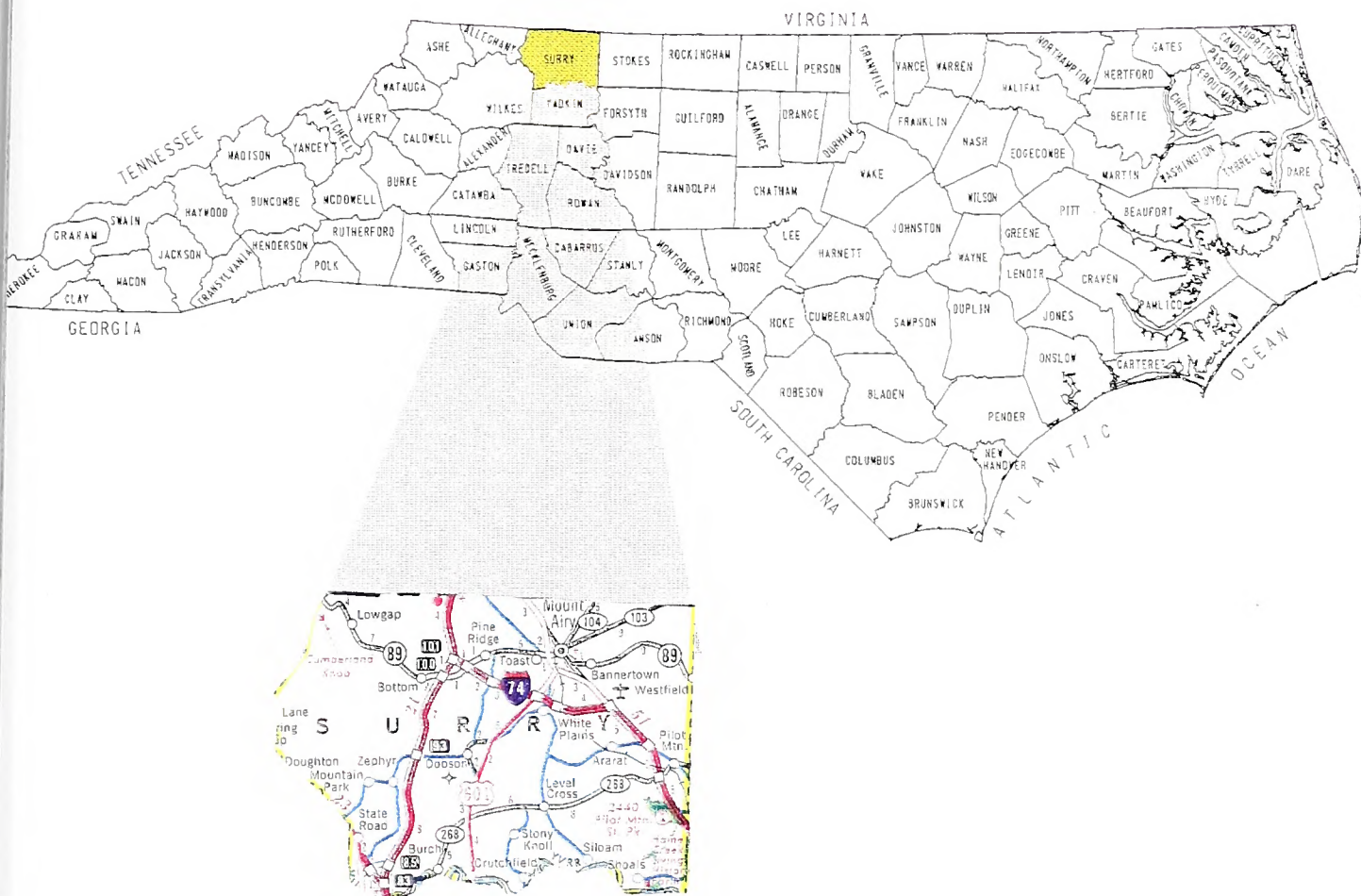


FIGURE 1

Chapter 1

Introduction

Overview

Officials of Surry County requested the North Carolina Department of Transportation's (NCDOT) assistance in developing a new thoroughfare plan as part of a larger effort to plan for the County's future. County officials are concerned about the impacts that the new Interstate 74 between I-77 and US 52 may have on several parts of the County. Several of the larger thoroughfares within the County, such as NC 268, US 601 and NC 89, need to be improved to better serve the inter-county travel between towns.

Most of the proposed improvements in the thoroughfare plan will be the responsibility of the North Carolina Department of Transportation. The plan can assist in the implementation of subdivisions regulations and zoning ordinances when utilized by the County. Surry County has chosen not to adopt the plan at this time.

Thoroughfare Planning

A thoroughfare plan study identifies existing and future deficiencies in the transportation system of an area, and uncovers the need for new facilities. The objective of thoroughfare planning is to enable the transportation network to be progressively developed to adequately meet the transportation needs of a community or region as land develops and traffic volumes increase. Through proper planning for road development, costly errors and needless expenses can be averted. Thoroughfare planning is a tool that can be used by local officials to plan for future transportation needs, as well as minimize negative impacts on the environment and the county.

The primary purpose of this report is to present the findings and recommendations of the thoroughfare plan study conducted for Surry County. The secondary purpose is to document the basic thoroughfare planning principles and procedures used to develop these recommendations. The first part of the report covers the major discoveries of the study (Chapter 1). The second part of the report describes the Thoroughfare Plan study recommendations and addresses different methods to help with the implementation process of the plan (Chapter 2 & 3). The last part of the report covers trends and related issues, the study procedure and findings and environmental data. (Chapter 4,5, and 6).

Two major benefits are derived from thoroughfare planning. First, each road or highway can be designed with a specific function and a specific level of service in mind. This will save money in right-of-way, construction, and maintenance costs. Through traffic will be minimized in neighborhoods by designating certain roads to be used primarily for through-travel. Also, local officials will be informed of future road improvements, which can be incorporated into other planning and policy decisions. This will minimize negative impacts to the community by allowing developers to design subdivisions that incorporate proposed roads, and allowing school and park officials to better locate their facilities.

Background

Surry County lies in the northwestern region of North Carolina and covers approximately 540 square miles. The county is bounded by the State of Virginia to the north (Grayson, Carroll and Patrick Counties) and by the Yadkin River to the south. Alleghany County and Wilkes County form the western border, and Stokes County forms the eastern border. Yadkin County takes up most of the southern border and Forsyth County touches the southeast corner of Surry County.

Surry County falls between the Piedmont Plateau and the Blue Ridge Mountains. About 85 percent of the county consist of a broad, upper plateau sloping to the southeast, with elevations ranging from 300 feet to 2,000 feet above mean sea level. The remaining 15 percent lies mainly to the west within the Blue Ridge foothills where elevations range up to 3,600 feet above mean sea level.

Summary of Recommendations

The following is a summary of major recommended improvements to the roads and highways in Surry County over the next 30 years. These improvements are based on many factors, including population projections, land use patterns, traffic data, roadway conditions, bridge conditions, environmental concerns, and public input. The plan includes all improvements that are essential for an efficient transportation system within the 1995-2025 planning period. The plan does not attempt to modify the thoroughfare plans already developed for the small urban areas within Surry County.

- **NC 89**, from Stokes County to Mount Airy, widen to 12-foot travel lanes, safety improvements (straighten out horizontal and vertical curves and improve shoulders).
- **NC 89**, from multi-lane section west of Mount Airy to SR 1399 (Oak Grove Church Road), widen to multi-lane facility.
- **NC 89**, from SR 1399 (Oak Grove Church Road) to Virginia line, widen to 12-foot travel lanes, perform safety improvements to allow for safe travel coming from or going to the mountains.
- **NC 268**, from Market Street/Standard Street in Elkin to SR 1144 (Johnson Ridge Road), widen to a multi-lane facility. (Current TIP Project R-3606)
- **NC 268**, from SR 1144 (Johnson Ridge Road) to SR 2048 (Shoals Road) in Pilot Mountain. Upgrade roadway and provide turn lanes. Widen to 12-foot travel lanes with turn lanes at major intersections such as US 601, SR 2221, and SR 1003. Also, construct adequate shoulders and straighten out vertical and horizontal curves where necessary to improve safety.
- **SR 1003**, from NC 268 at Level Cross to SR 2258 near White Plains, widen travel lanes to 12-foot to accommodate truck traffic from adjacent commercial/industrial areas.

- **SR1001 (Zephyr Road)**, projected 2025 volumes at these locations are, 12,000 vpd and 11,900 vpd, respectively which exceeds the capacity of a two-lane facility. Therefore to better serve anticipated future traffic volumes, it is recommended that this facility be widened from I-77 to US 601 Business to multi-lanes.

Implementation

The development of the thoroughfare plan is the first step in getting new road and highway projects implemented. This plan should be used by Surry County as technical support when requesting projects from Board of Transportation Members, from the NCDOT Division Engineer, or at the Transportation Improvement Program (TIP) hearings held each fall. The plan should also be used when the County develops other plans, such as land use, parks and recreation area comprehensive plans, or when making policy decisions, such as subdivision approvals, to ensure that these will be compatible with the proposed roadway system.

The Statewide Planning Branch of NCDOT can help with these tasks by answering questions, reviewing subdivision plans, and preparing functional designs of proposed roads.

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Chapter 2

Recommended Thoroughfare Plan

Intent of Thoroughfare Plan

A region's economic vitality depends on its transportation system. People cannot easily reach their intended destinations, goods cannot be delivered to markets in a cost-effective manner, and investors may look to invest in better-served areas if the transportation system of an area is not adequate. Recent trends such as regional economics, "just in time" delivery, increased automobile ownership, and increased migration away from the central cities and towns are taxing the existing transportation system and requiring that more emphasis is put on planning for future transportation needs.

A thoroughfare planning study identifies existing and future deficiencies (see Figure 2) in the transportation system and proposes solutions to solve these problems. The thoroughfare plan recommendations outline the transportation system needed to satisfy anticipated traffic demands in Surry County over the next 30 years. Each road in the thoroughfare plan was evaluated based on the following factors: alignment, capacity, width, number of lanes, traffic volume, land use patterns, and pavement structure. Recommendations for road improvements are based on these evaluated factors. Additionally, concerns such as environmental issues, economic growth, and local input were also considered in the development of the plan.

The thoroughfare plan recommendations for Surry County are listed below according to the functional classification of each facility identified in the study (see Appendix B for a description of functional classification). The primary objective of this plan is to reduce traffic congestion and improve safety in order to eliminate both existing and projected deficiencies in the thoroughfare system. See Figure 3 for recommendations.

Thoroughfare Plan Recommendations

Interstate:

I-77 This facility is the major north-south route for Surry County. It is also a major north-south route for the State of North Carolina connecting Charlotte and the State to cities in South Carolina and Virginia and beyond. The 1995 volumes range from 17,000 vehicles per day (vpd), at the NC 89 interchange to 29,000 vpd at the Yadkin County Line. The 2025 volumes at these locations are expected to increase to 37,500 and 59,000 vpd respectively.

Principal Arterials:

US 52 A major four-lane facility that connects the east-west route of I-40 with the north-south route of I-77. This facility is also the connecting route between Winston-Salem and Mount Airy in Surry County. Improvements for this facility are included in the (2002-2008 NCDOT)

Transportation Improvement Program as an unfunded project. From NC 65 in Winston-Salem to I-74 in Surry County it is recommended to upgrade US 52 to interstate standards.

Minor Arterials:

US 601 This route is classified as a minor arterial and serves traffic in a north-south direction mainly between Yadkin County and Mount Airy. NC 268 is a major collector that crosses US 601 and runs east west through the southern section of Surry County. The section from Yadkin County line to south of Mount Airy is currently a 2-lane roadway with variable travel lane widths.

The 1995 ADT (Average Daily Traffic) counts on US 601 range between 3,000 and 3,400 vpd for the section below NC 268. Projected ADT's show the range increasing to between 5,500 and 9,500 vpd which is over capacity for the current facility. The section between NC 268 and south of Mount Airy currently carries between 4,200 and 9,200 vpd, with increasing traffic volumes as NC 601 approaches Mount Airy. The projected ADT counts for 2025 indicate between 9,200 and 17,400 vpd.

Several high accident intersections are also found along NC 601. These intersections are located at NC 268, SR 2221 and SR 2258(Old US 601). The first intersection with NC 268 and US 601 had 16 accidents between June 1993 and June 1996 and involved one fatality. Eighty-one percent of the accidents involved were angle collisions. This type of accident could be a result of poor sight distance due to improper vertical and horizontal alignment. Eight accidents were reported at the intersection of SR 2221 and US 601 between June of 1993 and 1996. Seventy five percent of these accidents involved a car being hit at an angle, and 2 fatalities were reported. This could be a result of poor sight distance at the intersection for vehicles trying to enter or exit US 601. The third high accident intersection was at SR 2258 (Old US 601) and US 601. This intersection had 17 accidents in the above mentioned 3-year period and involved one fatality. The two most predominant types of accidents at this intersection were angle collisions and rear-end collisions while slowing or stopping. This could be the cause of poor sight distance as well as not having turn lanes on US 601.

NC 89 The section of NC 89 west of Mount Airy to the Virginia border in the northwest corner of the county is classified as a minor arterial and is primarily a 2-lane roadway with variable travel lane widths. The section between Mount Airy and I-77 is currently carrying between 15,400 and 19,900 vehicles per day, a very high volume of traffic for this type of facility. The traffic volume is expected to decrease by at least 8,000 vehicles per day as soon as I-74 opens to traffic between I-77 and US 52, but the commercial activities along this section of NC 89 will still be responsible for heavy truck traffic as well as other traffic. The 2025 projected ADT counts show the values increasing on NC 89 back to the current traffic counts.

Several density accident intersections are also located along this section of NC 89. These intersections are located at SR 1618 (Maple Grove Church Road) and at SR 1396 (Pine Ridge Road). The intersection with SR 1618 had 10 accidents between June, 1993 and June, 1996. The Pine Ridge Road intersection had 14 reported accidents during the same time period. No

fatalities were listed and the most predominant type of accident for both intersections were rear-end accidents when slowing or stopping.

It is recommended that the section between Mount Airy and SR 1399 (Oak Grove Church Road) just west of I-77 be widened to a multi-lane facility (Cross-section C, Appendix A), to improve traffic congestion and safety. A four-lane median divided facility is not feasible because it will limit the access to the businesses located on NC 89.

The section from I-77 to the Virginia border provides travelers access to and from the Blue Ridge Mountains. The roadway is currently a two-lane facility with travel lanes approximately 10 feet wide. The terrain is rolling and the road is very curvy. Current traffic counts steadily decrease towards the Virginia border, with 1,800 vehicles per day (2025 projected value of 3,300 vpd) at the Virginia Border and a maximum count of 5,300 vehicles per day (2025 projected value of 12,800 vpd) closer to SR 1399 (Oak Grove Church Road) just west of I-77.

One high accident intersection is located on this section where NC 18 meets NC 89 in the northwest corner of Surry County. Twelve accidents were reported between June of 1993 through 1996, but no fatalities were listed. *It is recommended that the section of NC 89 between SR 1399(Oak Grove Church Road) and the Virginia Border be widened to 12-foot travel lanes with adequate shoulder widths to provide for safe travel for vehicles going to and coming from the mountains. Also, horizontal and vertical curves should be straightened where possible.*

Major Collectors:

NC 89 The section of NC 89 between Stokes County and Mount Airy is classified as a major collector and serves traffic to and from Stokes County as well as local traffic in the northeastern part of Surry County. Most of the land use along this section is residential as well as some agricultural. The roadway is extremely curvy and the existing 2-lane roadway consists of only 9-foot travel lane widths with grassy shoulders ranging from 2 to 4 feet in width. Current traffic volumes increase as NC 89 approaches Mount Airy. The 1995 ADT counts indicate 1,900 vpd using NC 89 closer to Stokes County and 2,100 vpd traveling on NC 89 closer to Mount Airy. The 1995 ADT count just inside the Mount Airy planning area indicates a volume of 4,200 vpd on NC 89. The projected 2025 counts for the above mentioned areas range from 4,000 vpd to 8,800 vpd, traveling from Stokes County towards Mount Airy. *Recommendations for this section of NC 89 include widening the travel lanes to 12 feet, increase the shoulder widths, as well as straightening out the curves in the horizontal and vertical alignments. This will ensure safer travel conditions and provide a more convenient route for east/west travel to and from Stokes County.*

NC 268 The section of NC 268 between Elkin and Pilot Mountain is classified as a major collector and is used for inter-county travel in an east/west direction through Surry County. NC 268 collects traffic in surrounding areas and provides access to I-77, US 601, and US 52. The roadway is mostly a 2-lane facility with travel lane widths varying between 9 and 12 feet. Current traffic counts show that NC 268 carries between 1,600 and 6,300 vehicles per day, with most of the traffic concentrated around the Elkin and Pilot Mountain areas. Traffic forecasts

indicate that NC 268 could be carrying between 3,400 and 13,200 vehicles per day in the year 2025.

NC 268 has 3 high-density accident intersections. The first intersection is located at US 601 and was discussed in detail in the recommendations for US 601. The second high-density accident intersection is located at SR 2221 (Rockford Road). Eleven accidents were reported between June 1993-96 and involved two fatalities. Most of the accidents (45%) involved angular collisions. This could be a result of poor sight distance at the intersection. The third high-density accident intersection is at Level Cross at SR 1003 (Siloam Road). Eleven accidents were reported in the above mentioned 3-year period, but involved no fatalities.

It is recommended that travel lanes on NC 268 SR 1144 (Johnson Ridge) in Elkin to SR 2048 (Shoals Road) in Pilot Mountain be widened to 12 feet with adequate shoulder widths and that additional turn lanes be provided at intersections with US 601, SR 2221 and SR 1003. Horizontal and vertical curves should also be straightened for additional safety. Improvements to this facility are identified as a future need in the 2002-2008 Transportation Improvement Program as an unfunded project R-3423.

A recommendation is made that safety improvements be done to the section between Market Street and SR 1144 (Johnson Ridge Rd.) in Elkin. Widening of the roadway to a multi-lane facility is also recommended to alleviate peak hour congestion problems. TIP Project R-3423 identifies the need for these recommendations. A feasibility study has been conducted on the proposed improvements.

NC 103 This facility connects Mount Airy with Eastern Surry County and Southern Virginia. It is used primarily by local traffic for working and shopping in Mount Airy. The 1995 ADT count along this section of road were 2,900 vpd. Based on projections developed as part of the Mount Airy Thoroughfare Plan, future year 2025 volumes are expected to be 6,200 vpd. *In order for this facility to better serve anticipated volumes with increased safety, it is recommended that, from the Mount Airy City Limits to the Virginia State Line, NC 103 be widened from 20 feet to 24 feet with improved shoulders and vertical and horizontal alignment be improved where feasible.*

SR 1001 (Zephyr Road) – This facility serves central Surry County by connecting I-77 to the county seat of Dobson. The pavement width along this section averages 22 feet. Traffic counts taken by NCDOT show the 1995 ADT volume to be 5,500 vpd at I-77 and 6,900 vpd at US 601 Business. Projected 2025 volumes at these locations are 12,000 vpd and 11,900 vpd, respectively which exceeds the capacity of a two-lane facility. *Therefore, to better serve anticipated future traffic volumes, it is recommended that this facility be widened from I-77 to US 601 Business to multi-lanes.*

SR 1003 (Siloam Road) The section of SR 1003 (Siloam Road) from SR 2058 (Old US 601) is classified as a major collector and carries heavy truck traffic for businesses in the area. The current roadway consists of ten-foot-wide travel lanes with no shoulders. The 1995 ADT counts taken north of NC 268 on SR 1003 to the planning boundary of Mount Airy indicate traffic volumes between 1,500 and 2,900 vehicles per day. Traffic projections for the design year are showing values between 3,100 and 6,000 vehicles per day. *To improve safety and operations*

along SR 1003, it is recommended that this roadway be widened to two 12-foot travel lanes. Constructing adequate shoulder widths and widening bridges or drainage structures to make them functionally useable are also recommended.

Minor Collectors:

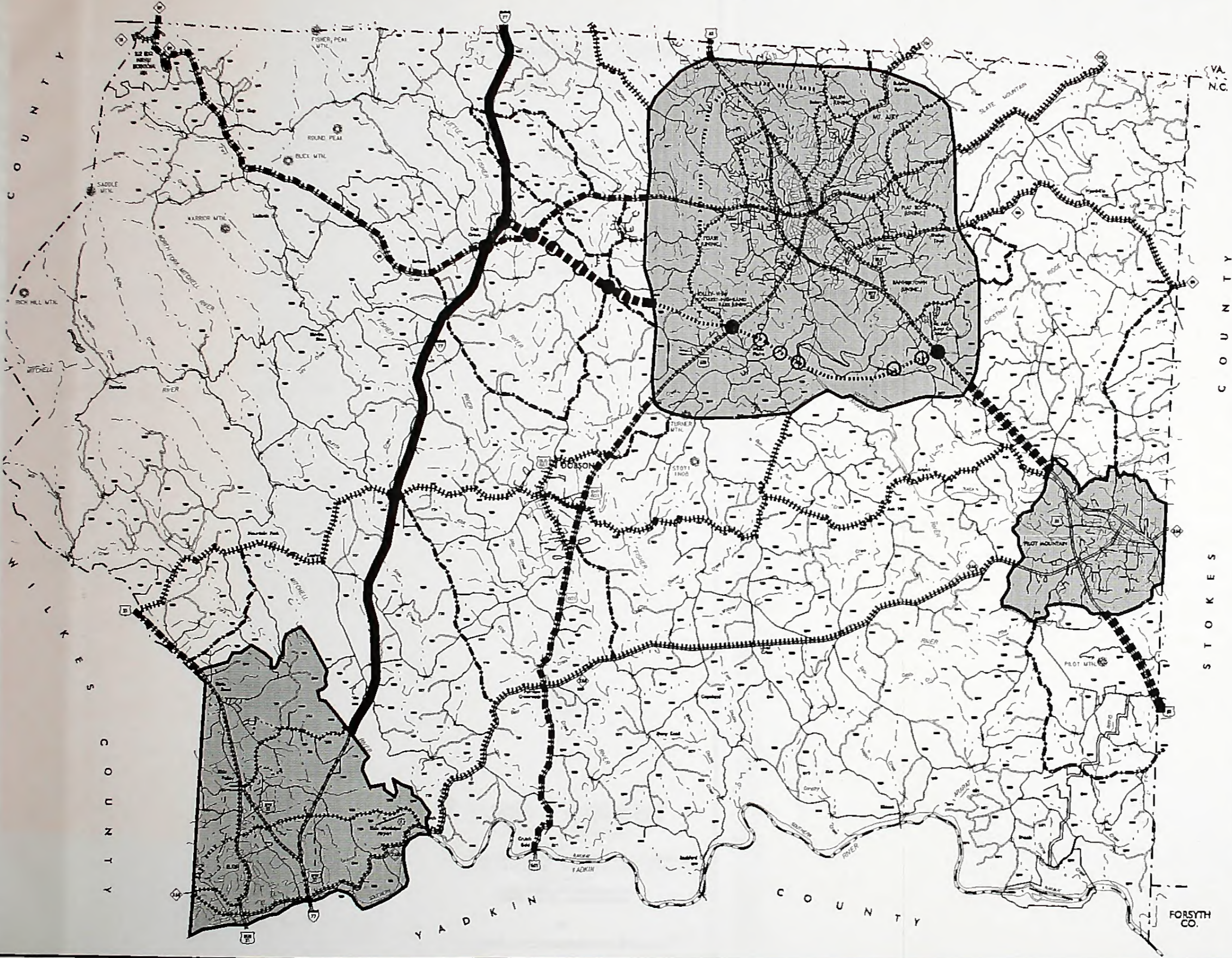
SR 1350 (Red Brush Road) – SR 1350 (Red Brush Rd) is used extensively as a cut-through route from NC 89 to Dobson. The 1995 traffic count on SR 1350 was 1,000 vpd. The existing facility is two lanes, 20 feet wide. A new project around Mount Airy and an interchange with SR 1350 has been completed. The volume of traffic using SR 1350 is expected to increase greatly with the design year 2025 volumes of 10,000 vpd toward NC 89 and 5,000 vpd toward Dobson. *It is recommended that SR 1350 be improved to 24 feet with improved shoulders from NC 89 to SR 1354 (Smith Road).*

SR 1345 (Beulah Church Road/Prison Camp Road) SR 1345 is a two lane 20 foot wide facility that connects NC 89 west of I-77 with US 601 Business in Dobson. The 1995 ADT counts shows 2,700 vpd and by the design year 2025 this volume is expected to increase to 2,900 vpd. It is recommended that SR 1345 be improved from the existing two-lane, 20 foot to a 24 foot cross section.

SR 1809 (Pilot Westfield Road) – This facility serves eastern Surry County, moving traffic from Stokes County and NC 89 to Pilot Mountain. A review of 1995 ADT counts shows 2,700 vpd using SR 1809. *By the year 2025 it is projected that 6,500 vpd will use SR 1809. It is recommended that the existing two-lane, 20 foot wide facility be improved to a 24 feet wide facility.*

SR 1815 (Cook School Road) – This facility connects directly with US 52 in two locations and serves the portion of the county just north of Pilot Mountain. The average daily traffic volume is 3,000 vpd. The land use adjacent to Cook School Road is commercial. It interchanges with US 52 and also passes the Mount Airy Airport. The remainder of the land use is mainly residential. SR 1815 ties into SR 1812 (Jessup Grove Church Road). Jessup Grove Church Road passes Westfield Elementary School. This school is served by buses that travel on Cook School Road. The existing width is 20 feet with a grass shoulder. *As a safety improvement, it is recommended that the existing facility be widened to 24 feet when resurfacing is scheduled and paved where needed as part of the secondary road program.*

SR 1812 (Jessup Grove Church Road) – This road serves primarily residential traffic in eastern Surry County. It has an elementary school located on it and a portion of it is unpaved. The existing width on the paved section is twenty feet. *It is recommended that the existing facility be resurfaced and paved where needed as part of the secondary road program.*



RECOMMENDED THOROUGHFARE PLAN

LEGEND

- Interstate
- Other Principal Arterial
- Minor Arterial
- Major Collector
- Minor Collector
- Urban Freeway
- Urban Major Thoroughfare
- Urban Major (Proposed)
- Construction Phase
- Interchange
- Grade Separation
- Planning Area Boundary

- Adapted By: Surry County
- NCDOT
- Recommended By: Statewide Planning
- Public Hearing Dates:



SURRY COUNTY NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS - STATEWIDE PLANNING BRANCH
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION







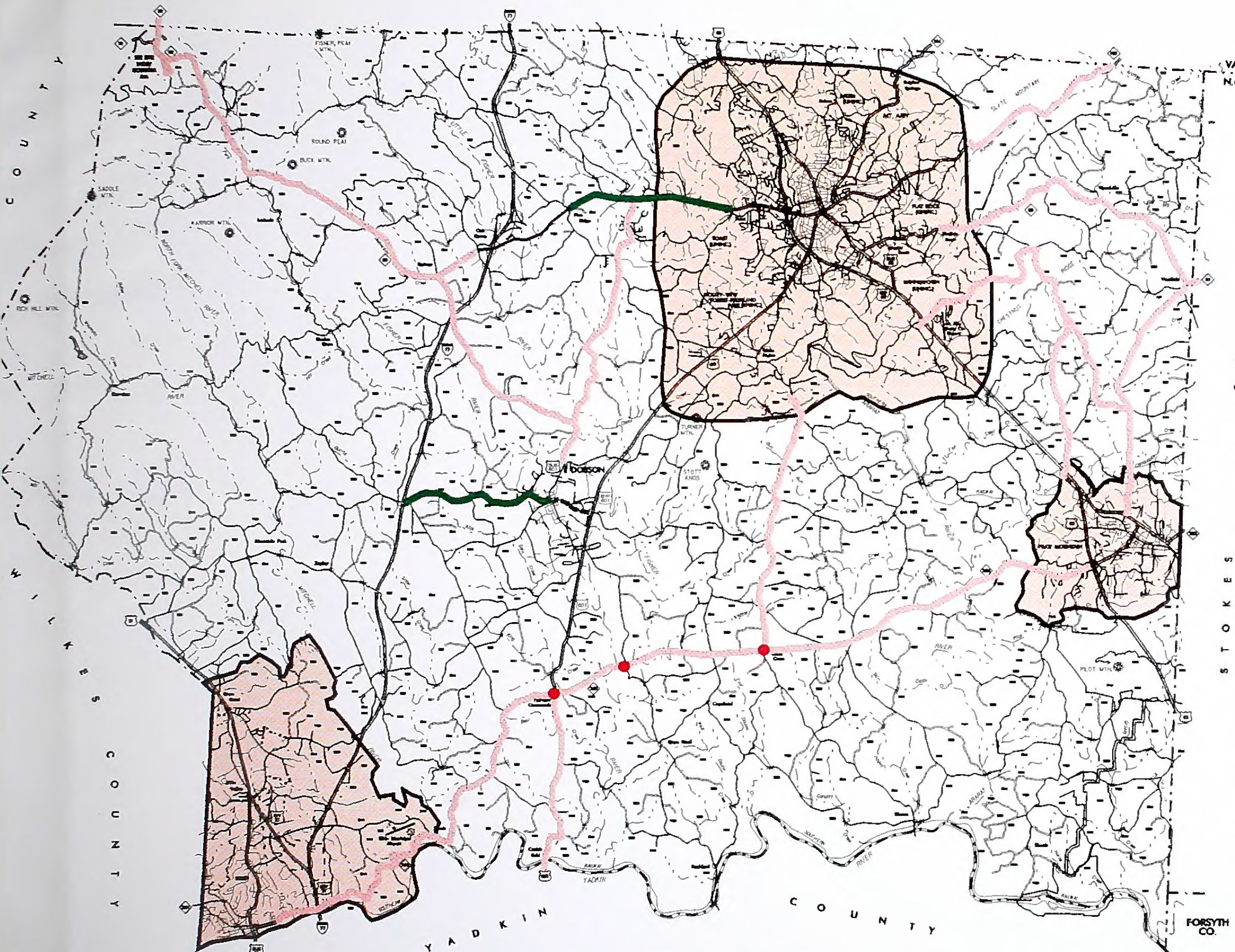
FIGURE 2

RECOMMENDATIONS

MARCH 19, 1999

LEGEND

-  4-lane divided w/median
-  Widen to 12 foot lanes
-  5-lane curb and gutter
-  Add turning lanes



SURRY COUNTY NORTH CAROLINA

REVISED BY US
 NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS - STATEWIDE PLANNING BRANCH
 IN COOPERATION WITH
 U.S. DEPARTMENT OF TRANSPORTATION
 FEDERAL HIGHWAY ADMINISTRATION



FIGURE 3

Bicycle Needs

This section is dedicated to addressing the bicycle needs of Surry County. Surry County has one designated bicycle route: The North Line Trace, NC Bike Route 4. Because of this designation these facilities may be subjected to more bicycle traffic than other facilities of similar design. Due to this shared, or multi-modal use of these facilities, it is recommended that sub-standard sections be widened to a standard 24 foot cross-section with 2 foot paved shoulders. These improvements will enhance safety and the functional design of the facility. The following facilities are part of designated bicycle route in Surry County and have sub-standard widths.

North Line Trace (NC Bike Route 4)

SR 1315 (Zephyr Mtn. Park): From Alleghany County Line to SR 1001

SR 1001 (Zephyr Road): From SR 1315 to SR 1110

SR 1110 (Twin Oaks Road): From SR 1001 to SR 1100

SR 1100 (Caves Mill Road): From SR 1110 to SR 1003

SR 1003 (Siloam Road): From SR 1100 to SR 2019

SR 2019 (Ararat Road): From SR 1003 to SR 2022

SR 2022 (Toms Creek Road): From SR 2019 to SR 2024

SR 2024 (Toms Creek Road): From SR 2022 to NC 268

NC 268: From SR 2024 to Stokes County Line

When considering the widening of these facilities, it is recommended that the office of Bicycle and Pedestrian Transportation (NCDOT) be consulted. They can help provide the most appropriate improvements based on present and future bicycle traffic. The county should contact the coordinator of this branch for further consideration and assistance.

**Bicycle and Pedestrian Program
NC Department of Transportation
1554 Mail Service Center
Raleigh, NC 27699-1554**

The first part of the report discusses the importance of the research and the objectives of the study. It also outlines the methodology used and the results of the study. The second part of the report discusses the implications of the findings and the conclusions drawn from the study. The third part of the report discusses the limitations of the study and the areas for further research.

The findings of the study indicate that there is a significant relationship between the variables studied. The results suggest that the independent variable has a positive effect on the dependent variable. The study also found that the relationship between the variables is mediated by the third variable. The implications of these findings are discussed in detail in the report.

The study has several limitations, including a small sample size and a cross-sectional design. Despite these limitations, the study provides valuable insights into the relationship between the variables studied. The findings have important implications for practice and policy. Further research is needed to explore the relationship between the variables in more detail.

Chapter 3

Implementation

Implementation is one of the most important aspects of the thoroughfare plan. Implementation must be an integral part of this process, or the effort and expense associated with developing the plan is useless. This is the responsibility of the County. There are several tools available to assist in the implementation of the thoroughfare plan. They are as follows:

State-County Adoption of Thoroughfare Plan

The first step in the implementation process is the mutual adoption of the thoroughfare plan by Surry County and the North Carolina Department of Transportation. The mutually approved plan may then serve as a guide for the Department of Transportation in the development of the road and highway system for the County. The adoption of the plan by the County also enables standard road regulations and land use controls to be used effectively in the implementation of this plan.

Corridor Preservation

The next step in implementing the thoroughfare plan is corridor preservation. Corridor preservation is a critical step in the implementation process because it minimizes the disruption of future road construction on the local residents and businesses, as well as on the environment. Through measures such as subdivision, land use, and development regulations, the County can protect the necessary rights-of-way for the recommended improvements.

Subdivision Controls

Subdivision regulations require every contractor to submit to the County Planning Commission a plan of any proposed subdivision. It also requires that subdivisions be constructed to certain standards. Through this process, it is possible to require the subdivision streets to conform to the thoroughfare plan and to reserve or protect necessary rights-of-way for projected roads and highways that are to become a part of the thoroughfare plan. The construction of subdivision streets to adequate standards reduces maintenance costs and simplifies the transfer of streets to the State Highway System.

This tool would be applicable to the construction of any new facilities. Ensuring that contractors include planned transportation facilities in their designs can help reduce highway construction costs and possible disruption to future homes and businesses.

Land Use Controls

Land use regulations are an important tool in that they regulate future land development and minimize undesirable development along roads and highways. The land use regulatory system can improve highway safety by requiring sufficient setbacks to provide for adequate sight distances and by requiring off-street parking.

This tool would be applicable to facilities that are recommended to be widened to multiple lanes, such as US 601. Land use controls can help to ensure that these facilities will maintain their intended capacities by regulating the types of land use that develop along the roads

Development Regulations

Driveway access to a State-maintained street or highway is reviewed by the District Engineer's Office and by the Traffic Engineering Branch of the North Carolina Department of Transportation. In addition, any development expected to generate large volumes of traffic (e.g., shopping centers, fast food restaurants, or large industries) may be comprehensively studied by staff from the Traffic Engineering Branch, Statewide Planning Branch, and/or Roadway Design Unit of NCDOT. If done at an early stage, it is often possible to significantly improve the development's accessibility while preserving the integrity of the thoroughfare plan. Since the County is the first point of contact for developers, it is important that the County advises developers of this review requirement and cooperates in the review process.

Use of development regulations can help control increasing traffic and congestion along roads experiencing heavy development pressures. This situation could occur in the future along US 52 and US 601 as the traffic increases.

Funding Sources

The final step in the implementation process is to obtain funding for each project. Sources such as the Transportation Improvement Program, county construction accounts, small urban funds, enhancement funds, and industrial access funds are a few examples of funding sources available to the County.

Transportation Improvement Program

North Carolina's Transportation Improvement Program (TIP) is a document, which lists major construction projects the Department plans for the next seven years. TIP projects are matched with project funding sources. Every two years the TIP is updated, completed projects are removed, programmed projects are advanced, and new projects are added.

Bi-ennial TIP public hearings are held in October and November. At these public hearings, municipalities request projects to be included in the TIP. A Board of Transportation Member reviews all of the project requests in his or her division. Based on technical feasibility, need, and available funding, the Board Member decides which projects will be included in the TIP. In addition to highway construction and widening, TIP funds are also available for other projects including bridge replacement, highway safety, public transit, railroad crossings, and bicycle facilities.

County Construction Account

These funds are used to pave unimproved roads, widen roadways, stabilize dirt roads, make minor alignment improvements, and construct short connectors when appropriate. These

improvements are done on a priority bases that are developed by the Division Offices. For more information on County Construction Account Funds, contact the Division Engineer's Office.

Division Eleven Engineer's Office
NC Department of Transportation
PO Box 250
North Wilkesboro, NC 28659

Small Urban Funds

Small Urban Funds are discretionary funds that are distributed to municipalities for qualifying projects. A given municipality may receive funding for multiple projects, but there is a maximum of one million dollars per year per division. Division Engineer. Requests for Small Urban Fund assistance should be directed to the Division Engineer.

Enhancement Funds

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 provides federal funds for transportation enhancement activities. These activities must have a direct relationship to the intermodal transportation system. This relationship may be one of function, proximity, or impact. Activities that may be eligible for these funds include: pedestrian and bicycle facilities; acquisition of scenic easements and scenic or historic sites; scenic or historic highway programs; landscaping and other scenic beautification; historic preservation; rehabilitating and operating historic transportation buildings, structures, or facilities; preserving abandoned railway corridors; controlling and removing outdoor advertising; archaeological planning and research; and mitigating water pollution due to highway runoff. For additional information concerning these funds, contact the Program Development Branch of the NC Department of Transportation.

Industrial Access Funds

Industrial Access funds are used by the Department to finance both new highway construction and improvements to existing roads or bridges as incentive to develop industrial interests. For example, if an industry wishes to develop property that does not have access to a state maintained highway and certain economic conditions are met, then funds may be available for construction of an access road. For additional information concerning these funds, contact the Program Development Branch of the NC Department of Transportation.

The North Carolina Highway Trust Fund Law

The Highway Trust Fund Law was established in 1989 as a plan with four major goals for North Carolina's roadway network. These goals are:

1. To complete the remaining 1,1716 miles of four lane construction on the 3,600 mile North Carolina Intrastate System.
2. To construct a multi-lane connector in Asheville and portions of multi-lane loops in Charlotte, Durham, Greensboro, Raleigh, Wilmington, and Winston-Salem.

3. To supplement the secondary roads appropriation in order to pave, by 1999, 10,000 miles of unpaved secondary roads carrying 50 or more vehicles per day, and all other unpaved secondary roads by 2006.
4. To supplement the Powell Bill Program.

The portion of this law that will most benefit Surry County is the paving of the unpaved roads on the State maintained system. The Program and Development Branch of the NCDOT should be contacted for information on the Highway Trust Fund Law.

Implementation Recommendations

The following table provides a break down of the projects in the Surry County Thoroughfare Plan and the corresponding method that would best suit the implementation of the given project.

Table 1

Project	Funding Sources			Methods of Implementation					
	Local Funds	TIP Funds	Indust. Access	County Const.	T-Fare Acc	Plan	Subdiv. Ord.	Zoning Ord.	Develop. Review
NC 89 Mt. Airy- I-77		X		X		X			X
NC 89 Stokes Co.- Mt. Airy						X			
NC 268 SR 1144- SR 2048		X		X		X			
SR 1003 SR 1100- SR 2058						X			
SR 1003 SR 1144- SR 2058		X				X			X

Construction Priorities and Cost Estimates

Construction priorities vary depending on the criteria considered and the weight attached to these criteria. Most people would agree that improvements to the major thoroughfare system and major traffic routes are more important than improvements to minor thoroughfares where traffic volumes are lower. To be included in the North Carolina Transportation Improvement Program, a project must show favorable benefits relative to cost and should not be prohibitively disruptive to the environment. To help the State and the County in their efforts to implement the thoroughfare plan, the major projects have been placed in order of priority based on benefit/cost comparisons.

The results of this analysis are shown in Table 2. A discussion of the benefit/cost analysis and the computations for the major projects in Surry County are included in Appendix C.

Table 2

Recommended Improvement Priorities and Costs Estimates		
Priority	Description	Estimated Cost
1	NC 89 from multi-lane section west of Mt. Airy to SR 1399 (Oak Grove Church Road), widen to a multi-lane facility.(five lane curb and gutter).	\$13,013,000
*2	NC 268 from Market Street/Standard Street in Elkin to east of Veneer St., widen to a three-lane curb and gutter facility (TIP Project R-3606)	\$2,817,000
*3	NC 268 east of Veneer Street in Elkin to SR 2048 (Shoals Road) in Pilot Mountain, upgrade roadway to 12-foot (3.66 m) travel lanes and provide turn lanes at major intersections (TIP Project R-3423).	\$27,227,000
4	SR 1001 (Zephyr Road) from I-77 to Dobson. Widen existing road to a five-lane curb and gutter facility.	\$12,263,000
5	SR 1003 (Siloam Road) from NC 268 at Level Cross to SR 2258 (Old US 601), widen to 12-foot (3.66 m) travel lanes with adequate shoulder widths - widen bridges/drainage structures on above mentioned section of SR 1003 to make them functionally usable.	\$7,068,000
6	NC 89 from Stokes County to east of Mt. Airy, widen to 12-foot travel lanes with safety improvements.	\$8,180,000
7	NC 89 from SR 1399 (Oak Grove Church Road) to Virginia border, widen to 12-foot (3.66m) travel lanes with safety improvements.	\$13,636,000

* Included in 2002-2008 Transportation Improvement Program

Bridge Replacements

The ten lowest rated structurally deficient bridges and the ten lowest rated functionally obsolete bridges in Surry County are listed in Table 3. Some of these bridges are current TIP Bridge Projects. The location of these bridges is shown in Figure 7.

Table 3

Recommended Bridge Improvement Priorities						
Brg. No.	SD/FO	Facility Carried	Feature Intersected	Suff. Rating	1995 ADT	Replacement Cost Estimate
*57	SD	SR 1350	Little Fisher River	12.9	1000	\$323,000
221	SD	SR 1625	Pauls Creek	15.8	1900	\$270,000
338	SD	SR 1190	Yadkin River/city street/railroad	15.8	2000	\$2,857,000
*52	SD	SR 1341	Fisher River	20.1	500	\$290,000
*148	SD	SR 2044	Ararat River	23.8	150	\$565,000
326	SD	SR 2222	Fisher River	24.9	100	\$458,000
*138	SD	SR 2041	Bull Run Creek	27.9	60	\$282,000
64	SD	SR 1408	Roaring Fork Creek	29.0	410	\$201,000
89	SD	SR 1618	Creek	30.1	1700	\$270,000
88	SD	SR 1621	Pauls Creek	30.6	1500	\$358,000
29	FO	SR 1322	Mill Creek	35.7	320	\$164,000
*53	FO	SR 1331	Fisher River	38.6	1000	\$358,000
39	FO	SR 1328	Mitchell River	42.3	20	\$238,000
277	FO	SR 2054	Pilot Creek	42.3	70	\$148,000
257	FO	SR 1600	Creek	42.3	90	\$148,000
38	FO	SR 1330	Saddle Mt Creek	42.8	250	\$190,000
130	FO	SR 2015	Stony Creek	43.0	400	\$169,000
320	FO	SR 1613	Wood Creek	46.1	250	\$148,000
244	FO	SR 1809	SR 1856	46.1	3700	\$304,000
98	FO	SR 1798	Big Creek	46.2	200	\$183,000

* Included in the 2002-2008 Transportation Improvement Program

SD = Structurally Deficient

FO = Functionally Obsolete

Chapter 4

Trends and Related Issues

The objective of thoroughfare planning is to develop a transportation system that will meet future travel demand and enable people and goods to travel safely and economically. To determine the needs of an area, it is important to understand the role of population, the economy, land use, and vehicle registration and use.

Population

The amount of traffic on a section of road is a function of the size and location of the population it serves. Investigating past trends in population growth and forecasting future population growth and dispersion is one of the first steps for a transportation planner. Table 3 shows population trends and forecasts for individual townships and Surry County. This information illustrates the growth that is taking place in the county and is anticipated to continue into the next century. 1990 Census indicated that there were 2,466 housing units in the county.

Table 4

Population Trends of Surry County							
Township	Population					% Growth	
	1960	1970	1980	1990	2025	1960-90	1990-2025
Bryan	1,598	2,051	2,244	2,377	3,333	1.33	1.13
Dobson	4,559	5,154	6,288	6,683	9,424	1.28	1.15
Eldora	1,617	1,722	2,243	2,585	4,622	1.58	1.96
Elkin	5,160	5,164	5,842	5,842	6,752	0.41	0.48
Franklin	1,654	1,695	1,541	1,567	1,661	-0.18	0.19
Long Hill	622	592	1,178	1,434	2,391	2.82	1.72
Marsh	1,157	1,225	1,502	1,486	1,871	0.84	0.77
Mount Airy	20,704	20,963	23,616	23,378	26,964	0.41	0.48
Pilot	2,601	3,069	3,166	3,273	3,662	0.77	0.38
Rockford	1,141	1,223	1,241	1,392	1,691	0.66	0.65
Shoals	1,093	1,049	1,198	1,407	2,340	0.85	1.71
Siloam	731	784	879	859	1,321	0.54	1.44
South Westfield	1,581	1,683	1,209	1,302	1,675	-0.65	0.84
Stewarts Creek	2,483	3,569	5,446	5,939	9,973	2.95	1.74
Westfield	1,504	1,472	1,856	2,149	3,198	1.2	1.33
Surry County	48,205	51,415	59,449	61,704	78,103	0.83	0.79

Economy and Employment

An important factor to be considered in estimating the future traffic growth of an area is its economic base. The economic base determines the employment type and size, as well as commuter traffic patterns around the county. This will influence the population of an area.

According to the 1990 Census of Population and Housing, Surry County had 35,099 employed residents. Of the residents, 17% (6,115 residents) commuted to jobs outside Surry County each

day. Forsyth County employed 3,943 of Surry County's residents. Also, 9,307 people commuted *into* Surry County each day for employment, mainly from Wilkes County (2,257 residents). The relatively small number of out-commuters indicates that the county has a strong economic base. This pattern is expected to continue. Also, as noted above, there are a large number of in-commuters, which causes strain on the major road arteries during morning and afternoon peak rush hours. Commuting information for Surry County is summarized in Table 5.

Table 5

Commuting Patterns (100+ Commuters)		
Location of Residence	Location of Work	Number of Commuters
Surry County	Forsyth County	3493
Surry County	Guilford County	205
Surry County	Iredell County	100
Surry County	Stokes County	341
Surry County	Wilkes County	275
Surry County	Yadkin County	638
Surry County	Carrol County, VA	100
Surry County	Patrick County	131
Total Number of People Commuting from Surry County		6,115
Total Number of People Commuting to Surry County		9,307
Total Number of Employed Residents in Surry County		35,099
Total Number of People Working in Surry County		37,306

Data from the 1990 Census of Population and Housing.

Land Use

Land use refers to the physical patterns of activities and functions within a city or county. Most traffic problems in a given area can be attributed to the type of land use. For example, a large business might cause congestion as workers change shifts. However, during the remainder of the day traffic congestion at the business is rare. The distribution of different types of land use is the main influence on congestion. Traffic between different land uses varies depending on the size, type, density, and distance between each.

Typically in transportation planning, land uses are grouped into four categories:

1. Residential - all land devoted to the housing of people (excluding hotels and motels).
2. Commercial - all land devoted to retail trade, including consumer and business services and offices.
3. Industrial - all land devoted to manufacturing, storage, warehousing, and transportation of products.
4. Public - all land devoted to social, religious, educational, cultural, and political activities.

Locating where expected growth will occur within the county, determines the location of proposed thoroughfares or the improvements of existing thoroughfares.

A review of growth areas in Surry County shows high-anticipated growth on US 601 between Mount Airy and Dobson. This can be attributed to construction of the new US 52 Bypass of Mount Airy and the city's plan for an industrial park. Also, the trend in this area has been for additional residential and commercial development. Another high growth area is anticipated to be aligning along NC 89 between Mount Airy and I-77. This area has begun developing with commercial development and this trend is expected to continue in the future.

Surry County provides two main north-south routes to Virginia from central North Carolina, I-77 and US 52. Traffic volumes and development is expected to increase throughout the planning period. It is expected that most of this traffic growth will occur along the existing major highway corridors, such as US 52, I-77, US 601, NC 268, and NC 89.

Vehicle Registration

Since 1970, the number of registered vehicles in the county has increased at a greater rate than the population. This means that there are more vehicles available per person. Table 6 compares the ratio between population and the number of cars for North Carolina and Surry County. The table includes past and projected ratios. This ratio is obtained by dividing the total population of the area by the total number of vehicles registered in that area.

Table 6

Persons Per Vehicle Trends		
Year	Surry County	North Carolina
1970	1.79	2.03
1980	1.21	1.52
1990	1.18	1.35
*2000	1.06	1.24
*2010	0.94	1.15
*2020	0.84	1.11
*2025	0.83	1.09

* Estimated

Travel Demand

Average annual daily traffic volumes (AADT) for 1995 on selected major roads and highways in Surry County are shown in Figure 5. Also shown are projections for the year 2025 (Figure 6), assuming no changes to the existing street system are made. These projections were based on historic and anticipated population, economic growth patterns, and land use trends.

The goal of the Surry County Thoroughfare Plan is to provide adequate travel service along the major thoroughfares during the weekdays. This goal serves the residents of the County by providing for their daily trips to and from work and for accomplishing daily activities during the week. Weekends will continue to bring congestion and traffic from out-of-town travelers because of the Surry County's location.

Although minimum requirements are necessary for all roads serving the public, the ultimate design of a road will vary according to the desired capacity and level-of-service to be provided.

However, universal standards in the design of thoroughfares are not practical. Each road or highway section must be individually analyzed and its design requirements determined by the amount and type of projected traffic, existing capacity, desired level of service, and available right-of-way.

Many different factors contribute to the capacity of a roadway. These factors include:

1. Geometrics of the road, including:
 - number of lanes
 - horizontal and vertical alignment
 - proximity of perceived obstructions to safe travel along the road
2. Typical users of the road, including:
 - commuters
 - recreational travelers
 - truck traffic
3. Access control (including streets and driveways) along the road
4. Development along the road, such as:
 - residential
 - commercial
 - industrial
5. Number of traffic signals along the route
6. Peak traffic characteristics on the road:
 - rural roads tend to have a higher morning and afternoon peak period increase in traffic as compared to mid-day traffic
7. Characteristics of side-roads feeding into the road
8. Directional split of the traffic, or the percentage of vehicles traveling in each direction along a road at any given time.

It is difficult to determine exactly when a road will reach its capacity because of these factors, and the changing nature of roads as development occurs. At the thoroughfare planning level, the capacity of a road is estimated using the factors above and comparing them to other roads in the state with similar past circumstances. For a county study, a desired level of service is identified and capacities are determined by the ability of a driver to meet the speeds shown in Table 7.

Table 7

Minimum Levels of Service for Roads and Highways	
<u>Facility</u>	<u>Overall Travel Speed During Peak Traffic conditions</u>
Major and Minor Arterials	50-55 MPH
Major Collector Roads	45-50 MPH
Minor Collector Roads	40 MPH

For driver convenience, ease of operation, and safety, it would be desirable to widen all existing roads and highways to provide a minimum lane width of 12 feet. However, when considering overall statewide needs and available highway revenue, this improvement applied state-wide

would be impractical. Therefore, it is necessary to establish minimum tolerable widths for existing roads with respect to traffic demands that would be economically feasible. The widths used in determining the existing lane deficiencies in Surry County are given in Table 8

Table 8

Minimum Tolerable Lane Widths			
Average Daily Traffic	Principal Arterials feet	Minor Arterials feet	Collectors feet
Over 2,000	11	11	11
400 - 2,000	-	10	10
100 - 400	-	10	9
Below 100	-	-	9

There are a number of roadways in Surry County that have substandard widths. Because of the substantial costs of upgrading all secondary roads to standard (24' pavement), narrow widths may have to be tolerated until sufficient funds are available for improvements. The roads identified as a part of the Surry County's Thoroughfare Plan study that have substandard widths are listed below:

- | | |
|---|------------------------------------|
| SR 1003 (Siloam Road) | SR 1809 (Pilot Westfield Road) |
| SR 1138 (CC Camp Road) | SR 1815 (Cook School Road) |
| SR 1350 (Red Brush Road) | SR 1812 (Jessup Grove Church Road) |
| SR 1345 (Beulah Church Road/Prison Camp Road) | |

Current Transportation Plans for Surry County

Thoroughfare Plans

Thoroughfare plans are tools used to aid officials in the development of an appropriate transportation system. It is important that the communities within a county and the county officials cooperate as a team in the development of their transportation system. Plan development and implementation jointly undertaken will help ensure the development of an efficient system for travel throughout the county. The following thoroughfare planning studies have previously been done for Surry County:

1. Pilot Mountain, plan adopted in 1997
2. Mount Airy, plan adopted in 1998

Transportation Improvement Program Projects

The Transportation Improvement Program (TIP) is a seven-year project document that lists the major transportation improvement projects that the Department of Transportation has planned. These projects include roadway projects, but also bridge projects, tunnel, railroad crossings,

bicycle facilities, and public transportation. Surry County has three major funded roadway projects and one bridge replacement project identified in the 2002-2008 TIP, which are listed below:

1. US 52 from NC 65 in Winston-Salem to I-74 in Surry County Upgrade to Interstate standards (TIP Project #R3441). *
2. NC 268, from Key Street in Pilot Mountain, to SR 2048 (Shoal Road) – Widen to a five lane curb and gutter facility (TIP Project #R3605). *
3. NC 268 Bypass, from east of Vener Street in Elkin to SR 2048(Shoal Road)/SR 2099 (Barney Venable Road) in Pilot Mountain. - Upgrade Roadway and provide turn lanes (TIP Project#R-3423).*
4. NC 268 Bypass, Pilot Mountain, from south Key Street to Old US 53 – Construct a two-lane facility on multi-lane right of way on new location. Identified Future Need project (R-3605).*
5. NC 268 Bypass, from NC 268 in west Elkin to US 21 Bypass, Construct a two-lane facility on multi-lane right of way new location. This project is currently under construction project (R-2604).

* **Identified Future Need** means that funding has not yet been established for this project.

Chapter 5

Roadway Analysis

Travel Deficiency Analysis

This chapter presents an analysis of the ability of the existing street system to serve the area's travel desires. Emphasis is placed not only on detecting the deficiencies, but also on understanding their causes. Travel deficiencies may be localized and the result of a substandard highway design, inadequate pavement width, or intersection controls. Alternately, the underlying problem may be caused by a system deficiency, such as a need for a bypass, loop facility, additional radials, or construction of missing links.

An analysis of the roadway system must first look at existing travel patterns and identify existing deficiencies. This includes roadway capacity and safety analysis. After the existing picture of travel in the area has been developed, the engineer must analyze factors that will impact the future system. These factors include forecast population growth, economic development potential, and land use trends. This information will be used to determine future deficiencies in the transportation system.

Capacity Deficiency Analysis

A good indication of the adequacy of the existing major street system is a comparison of the traffic volumes with the ability of the streets to move traffic freely and at a desirable speed. Capacity is defined as the maximum number of vehicles that can pass over a given section of roadway during a given time period under prevailing roadway and traffic conditions.

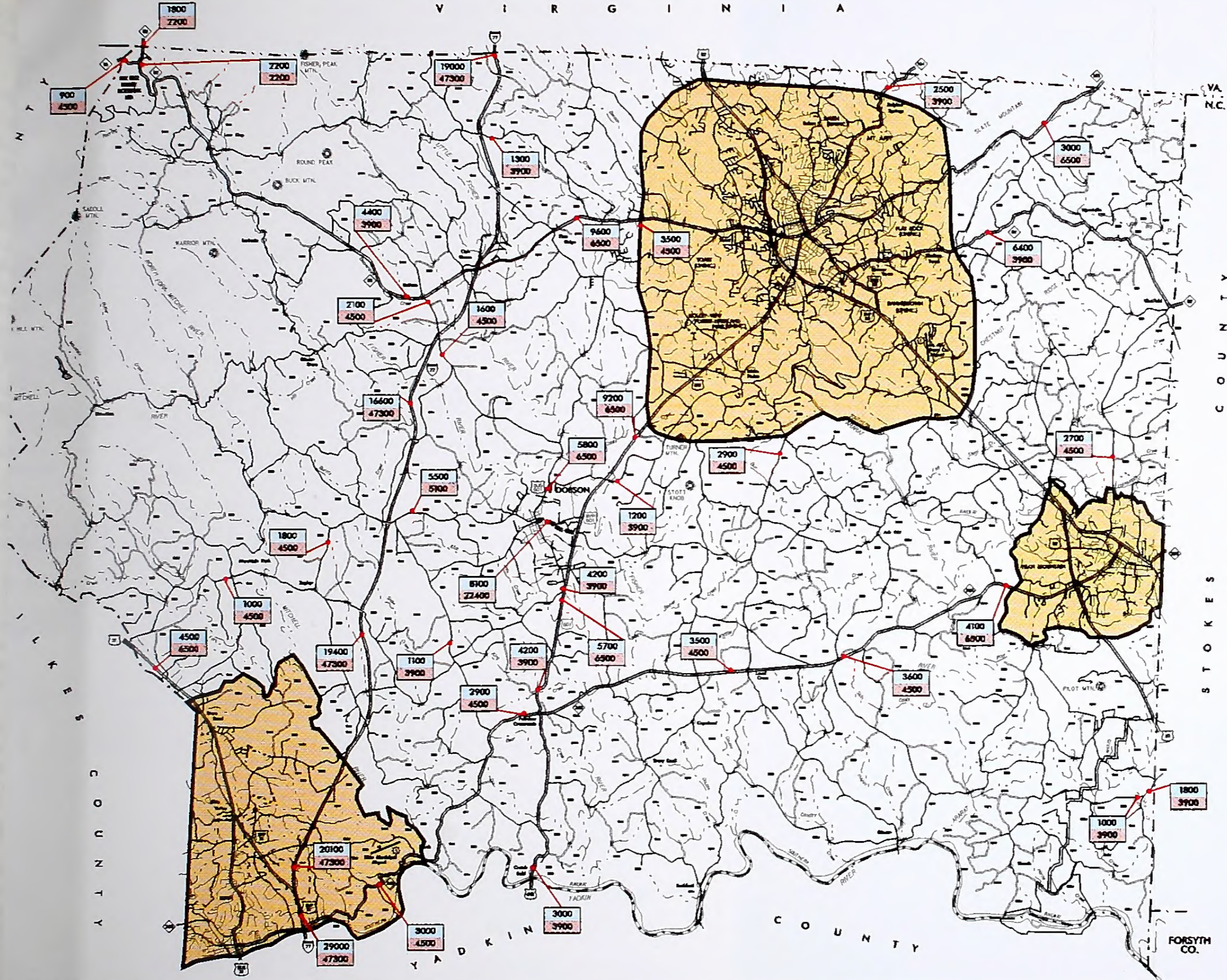
The relationship of traffic volumes to the capacity of the road determines the level of service being provided. The level of service (LOS) is a qualitative measure describing the operating conditions within a traffic stream and their perception by motorists and/or passengers. Six levels of service are used to identify the conditions existing along a highway or street. They are given letter designations, from LOS "A" to LOS "F," with LOS "A" representing the best operating conditions and LOS "F," the worst.

The recommended improvements in the thoroughfare plan were based on achieving a minimum LOS "C" on existing facilities and LOS "B" on new facilities. LOS "D" is considered the "practical capacity" of a facility, or that point at which the public begins to express dissatisfaction. These levels of service are defined and illustrated in Appendix E of this report.

1995 Analysis

The comparison of current annual average traffic volumes in Surry County with the existing road level of service C (See Figure 4) capacities indicates that three roads in Surry County are currently over capacity. These facilities are NC 89 from the Mount Airy City Limits to I-77 and SR 1001 (Zephyr Road) from I-77 to US 601 Business in Dobson.

1995 TRAFFIC VOLUMES OVER CAPACITY



LEGEND

1995 VOLUMES

CAPACITY

PLANNING AREA BOUNDARY

0000

0000

[Yellow Box]



SURRY COUNTY NORTH CAROLINA

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS - STATEWIDE PLANNING BRANCH
 IN COOPERATION WITH THE
 U.S. DEPARTMENT OF TRANSPORTATION
 FEDERAL HIGHWAY ADMINISTRATION

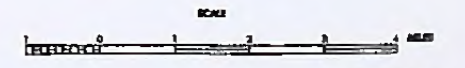


FIGURE 4

In the Transportation Improvement Program projects are identified that will improve traffic flow on NC 89. This project is I-74 the Mount Airy Bypass, which moves traffic from US 52 to I-77, this project should shift traffic from NC 89 to the new facility improving travel conditions.

2025 Analysis

Exceeding Capacity:

During the planning period from 1995 to 2025, two major facilities are expected to exceed their practical capacities. They are:

- NC 89 from the Mount Airy City Limits to I-77
- SR 1001 from I-77 to US 601 Business in Dobson

The NC 89 deficiency is partially being addressed in the current Transportation Improvement Program (TIP).

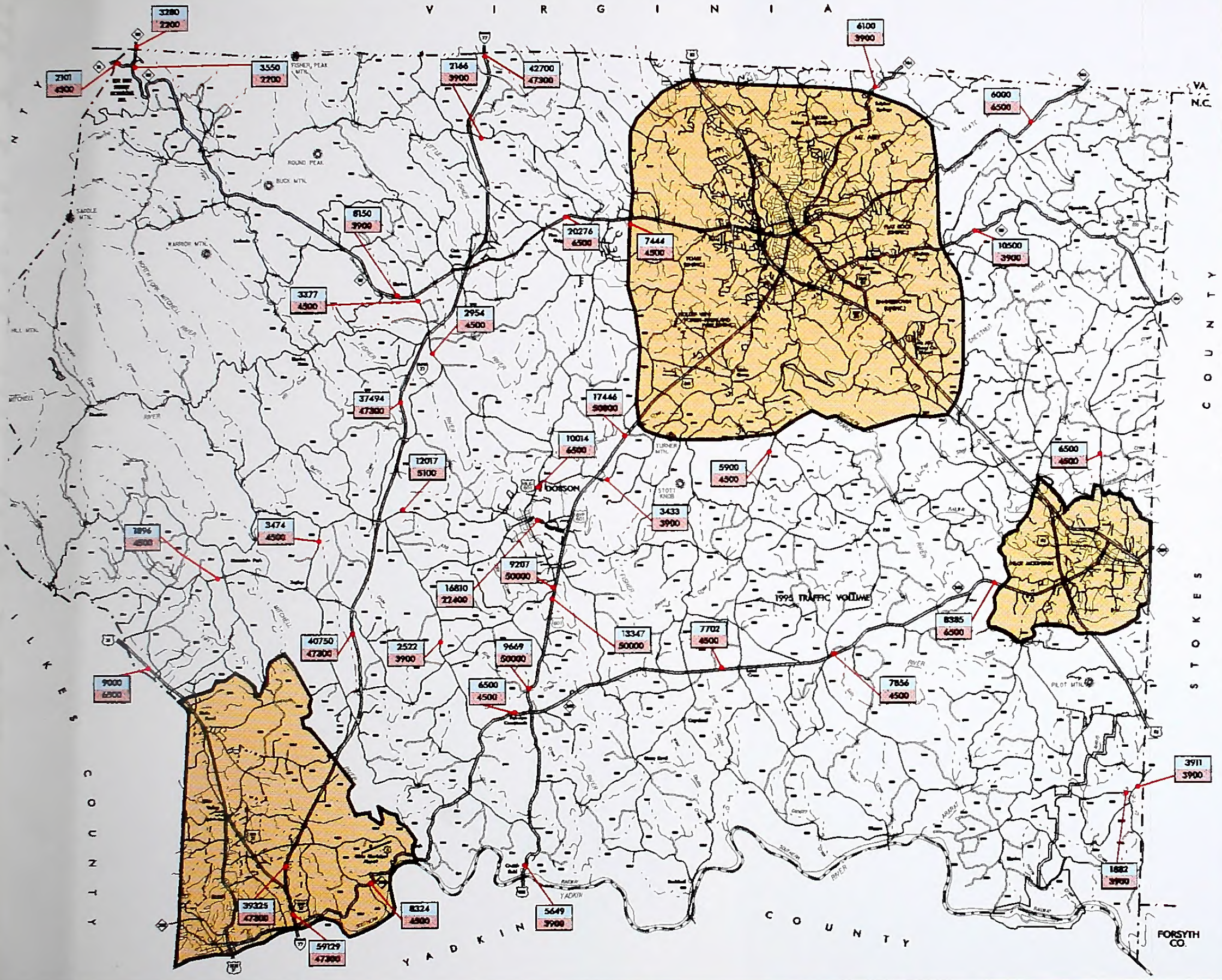
NC 89 traffic flow will be improved with the completion of I-74, TIP Project # R-98 reducing volumes from 20,000 vpd along this facility to 13,000 vpd. However, development from Mount Airy to I-77 along NC 89 is expected to cause volumes to continue to increase to 20,000 vpd in the future. It is recommended that NC 89 be upgraded to a multi-lane facility during the planning period.

SR 1001 connects I-77 to US 601 in Dobson, providing access from the heart of Surry County to the major north-south facility in the area. Currently 5,500 vpd use this 22 (twenty-two) foot wide facility. The I-74 Project may help traffic along SR 1001 some, however it is anticipated that by the design year 2025 this volume will increase to 12,000 vpd. Therefore, it is recommended that SR 1001 be improved to a multi-lane facility.

Approaching Capacity:

Currently two major facilities are approaching level of service C capacity, by 2025 these facilities are expected to approach their practical capacities. They are:

- NC 268 from Elkin to Pilot Mountain
- SR 1003 (Siloam Road) from the southern city limits of Mount Airy to NC 268



2025 FORECASTED TRAFFIC VOLUMES OVER CAPACITY

LEGEND

2025 VOLUMES
CAPACITY

PLANNING AREA BOUNDARY

0000
6000
3900



SURRY COUNTY
NORTH CAROLINA

PREPARED BY
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS - STATEWIDE PLANNING BRANCH
IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION



FIGURE 5

Surry County has two major east-west routes; they are NC 89 and NC 268. NC 268 connects US 321 in Lenoir with I-77 in Elkin and US 52 in Pilot Mountain, and passes through Wilkesboro along the way. Therefore it is an important route for moving traffic in this part of the state. Currently between Elkin and Pilot Mountain, 3,000 vpd use this facility. By the design year 2025 it is anticipated that 8,000 vpd will use this route. The design year volumes versus the capacities are shown in Figure 5.

Design Deficiencies:

- NC 89, from I-77 west to the Virginia Line
- NC 89, from the Eastern City Limits of Mount Airy to Stokes County

Accident Analysis

Traffic accidents are often used as an indicator for locating congestion problems. Traffic accident records can be reviewed to identify problem locations or deficiencies such as poor design, inadequate signing, ineffective parking, or poor sight distance. Accident patterns developed from the analysis of accident data can lead to improvements that will reduce the number of accidents.

Table 9 provides a summary of the accidents occurring in Surry County for the three year period between June, 1993 and June, 1996. This table only includes locations with 10 or more accidents. Both the number and severity of accidents are considered when investigating accident data.

As a part of this study, these accident locations were reviewed with the NCDOT division Traffic Engineer. The NCDOT Division 11 is actively involved with investigating and improving many of these locations. To request a more detailed analysis for any of the intersections listed below, or other intersections of concern, the County should contact the Division Traffic Engineer.

Table 9

**INTERSECTION ACCIDENT LISTING FOR SURRY COUNTY
JUNE 1993 – JUNE 1996**

#	CITY	LOCATION	# of Accidents	# of Injuries	Severity of Injuries				Predominant Accident Type
					F	A	B	C	
1	Rural	US 21/SR 1138	16	13		2	2	9	Rear End-Slowing/Stopping
2	Rural	US 601/NC 268	16	15	1		1	13	Car hit at Angle
3	Rural	US 601/SR 2221	8	12	2		1	9	Car hit at Angle
4	Rural	US 601/SR 2258	17	14	1	5	1	7	Car hit at Angle
5	Rural	NC 18/NC 89	12	4			1	3	Ran off Road – Left
6	Rural	NC 89/SR 1397	14	15		2	4	9	Rear End-Slowing/Stopping
7	Rural	NC 89/SR 1618	10	5			2	3	Rear End-Slowing/Stopping
8	Rural	NC 268/SR 1003	11	22		5	8	9	Car hit at Angle

Table 9 Continued

#	CITY	LOCATION	# of Accidents	# of Injuries					Predominant Accident Type
					F	A	B	C	
9	Rural	NC 268/SR 2221	11	17	2	6	2	7	Car hit at Angle
10	Elkin	US 21/Poplar Springs	12	18			9	9	Car hit at Angle
11	Elkin	Bridge/CC Camp	11	4				4	Left Turn-Same Roadway
12	Elkin	Bridge/Spring	14	2			2		Car hit at Angle
13	Dobson	Atkins and Main	15	5			2	3	Car hit at Angle

***Key to Severity of Injuries**

F - Fatality

A – Class “A” injury-incapacitating. The injury is obvious and severe enough to prevent carrying on normal activities for at least 24 hours; e.g., massive loss of blood or broken bone.

B – Class “B” injury-non-incapacitating. In this case, and injury other than a fatality or Class “A” injury is evident.

C – Class “C” injury-no visible sign of injury, but complaint of pain or momentary loss of consciousness.

Bridge Conditions

Bridges are a vital and unique element of a highway system. It is important that bridges be well constructed and inspected regularly to ensure safety of the roadway.

NCDOT's Bridge Maintenance Unit, following federal standards inspect all bridges in North Carolina at least once every two years. A sufficiency rating is calculated for each bridge to determine whether a bridge can remain in service. The bridges with the lowest ratings are replaced as Federal and State funds become available.

The sufficiency rating was used in this analysis to determine the deficiency of each bridge. The sufficiency rating measures several factors to determine whether a bridge is sufficient to remain in service, including: structural adequacy and safety; serviceability and functional obsolescence; essentiality for public use; type of structure; and traffic safety features. The result of this method is a percentage in which 100 percent represents an entirely sufficient bridge and zero percent represents an entirely insufficient or deficient bridge. A sufficiency rating of 50 percent or less qualifies for Federal Bridge Replacement Funds.

Deficient bridges are categorized as either structurally deficient or functionally obsolete. Structurally deficient bridges score below average in deck superstructure, substructure, overall structural condition, or waterway adequacy. Bridges in the functionally obsolete category have below average ratings in approach roadway alignment, under clearance, deck geometry, waterway adequacy, or structural condition. Table 10 shows functionally obsolete bridges and Table 11 shows structurally deficient bridges in Surry County. The location of these bridges is shown in Figure 7.

Table 10

Functionally Obsolete Bridges in Surry County			
Bridge #	Features Intersected	Facility Carried By Structure	Sufficiency Rating
52	Fisher River	SR 1342	34.7
29	Mill Creek	SR 1322	35.7
53*	Fisher River	SR 1331	38.6
148	Ararat River	SR 2044	40.0
39	Mitchell River	SR 1328	42.3
277	Pilot Creek	SR 2054	42.3
257	Creek	SR 1600	42.08
38	Saddle Mt Creek	SR 1330	43
130	Stoney Creek	SR 2015	46
244	SR 1856	SR 1809	46.1
320	Wood Creek	SR 1613	46.1
98	Big Creek	SR 1798	46.2
280	S. Fork Mitchell River	SR 1314	46.2
37	Mitchell River	SR 1330	48.3
33	N. Fork Mitchell River	SR 1334	48.5
156	US 52	SR 1815	48.9
188	West Double Creek	SR 2230	50.8
54*	Red Hill Creek	SR 1338	50.9
115	Flat Shoal Creek	SR 1826	51
259	Creek	SR 1788	53.3
190	Lovil Creek	US 52 Bypass	54.2
34	Johnson Creek	NC 104	56.9
153	Hagan Creek	SR 2081	57.3
31	Elkin Creek	NC 268	57.4
314	Snow Creek	SR 1123	57.4
242	Creek	SR 1312	58.6
228	Creek	SR 1353	59.4
102	Creek	SR 1837	59.7
157	Hagan Creek	SR 2038	60.1
13	US 268/Southern RR/Yadkin River	I-77	61.2
94	Ararat River	SR 1727	61.8
249	Creek	SR 1792	63.3
32	Ararat River	NC 103	63.8
184	Ararat River	US 52 Bypass	64.5
45	Fisher River	SR 1338	65.2

Table 10 Continued

58	Southern RR	US 52 B	65.4
6	US 268/Southern RR/Yadkin River	I-77	65.5
48	SR 2053	US 52 NBL	65.7
84	Creek	SR 1605	67.7
11	Little Creek	SR 1129	70.2
291	Flat Shoal Creek	SR 2012	71.1
165	Southern RR	NC 268	74.5
100	Southern RR/Creek	US 52 SBL	75.9
292	Stoney Creek	SR 2012	76.2
124	Stewarts Creek	SR 2000	76.5
8	SR 2061	US 52 NBL	76.9
21	Yadkin River	US 21 B	76.9
55	SR 2053	US 52 SBL	76.9
97	Southern RR/Creek	US 52NBL	76.9
126	Toms Creek	US 52 SBL	76.9
95	Creek	SR 1742	77.5
118	Beaver Creek	SR 1100	77.5
122	Toms Creek	US 52 NBL	77.9
227	Creek	SR 1389	77.9
342	SR 1856	US 52	77.9
245	Creek	SR 2034	79.2
329	Toms Creek	SR 1856	83
328	Toms Creek	SR 1856	85.3
360	NC 752	SR 1350	85.3
356	I-77 SB Ramp	NC 752	96

* Included in the 2002-2008 Transportation Improvement Program

Table 11

Structurally Deficient Bridges In Surry County

Bridge #	Features Intersected	Facility Carried By Structure	Sufficiency Rating
221	Pauls Creek	SR 1625	15.8
338	Yadkin River/city street/RR	SR 1190	15.8
52*	Fisher River	SR 1341	20.1
326	Fisher River	SR 2222	24.9
183*	Bull Run Creek	SR 2041	27.9
64	Roaring Fork Creek	SR 1408	29
89	Creek	SR 1618	30.1
88	Pauls Creek	SR 1621	30.6
221*	Pauls Creek	SR 1625	31.8
322	Stewarts Creek	SR 1622	32.8
213	Low Gap Creek	SR 1600	33.1
203	Ramey Creek	SR 1338	34.4
276	Pilot Creek	SR 2047	34.6
324	Creek	SR 1429	37.3
132	Toms Creek	SR 2024	37.4
215*	Little Fisher River	SR 1614	38.7
142	Grassy Creek	SR 2067	39
235	Archies Creek	SR 1791	40
251	Creek	SR 1345	41
330	Fisher River	SR 2258	43
150	Hagan Creek	SR 2085	43.9
80	Creek	SR 1602	45.9
261	Creek	SR 1601	47.2
46	North Fork Mitchell Creek	SR 1338	48.9
16	SR 2061	US 52 SBL	49.2
306	Big Creek	SR 1801	49.8
105	Toms Creek	SR 1830	52.5
151	Hagan Creek	SR 2082	53
62	Stewarts Creek	SR 1350	57.3
347	Creek	SR 2057	72.6

* Included in the 2002 – 2008 Transportation Improvement Program

The image shows a very faint grid or table structure on the right side of the page. It appears to be a ledger or a data table with multiple columns and rows. The lines are extremely light and difficult to discern, but the overall layout suggests a structured data format.

Chapter 6

Environmental Concerns

In the past several years, environmental considerations associated with highway construction have come to the forefront of the planning process. The legislation that dictates the necessary procedures regarding environmental impacts is the National Environmental Policy Act (NEPA). Section 102 of this act requires the execution of an Environmental Impact Statement (EIS) for road projects that have a significant impact on the environment. The EIS covers the impact of the project on wetlands, water quality, historic properties, wildlife, and public lands.

Environmental Screening

For all other projects on the thoroughfare plan, an informal environmental screening was conducted to evaluate potential impacts in several key areas of environmental concern. These areas are wetlands, threatened and endangered species, and historic sites. A discussion of each issue and the potential impacts to it are found below.

Wetlands

In general terms, wetlands are lands where saturation with water is the dominant factor in determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. Most wetlands have soil or substrate that is at least periodically saturated with or covered by water.

Wetlands are crucial ecosystems in our environment. They help regulate and maintain the hydrology of our rivers, lakes, and streams by slowly storing and releasing flood waters. They help maintain the quality of our water by storing nutrients, reducing sediment loads, and reducing erosion. They are also critical to fish and wildlife populations. Wetlands provide an important habitat for about one third of the plant and animal species that are federally listed as threatened or endangered.

In Surry County, wetlands are not a common occurrence. Most of the thoroughfare plan proposals are located within or along existing roadway corridors. Thus, the impact to any wetlands in the area will be minimal.

Threatened and Endangered Species

A preliminary review of the Federally Listed Threatened and Endangered Species within Surry County was done to determine the effects that any proposed improvements could have on these species. These species were identified using mapping from the North Carolina Department of Environment, Health, and Natural Resources.

The Threatened and Endangered Species Act of 1973 allows the US Fish and Wildlife Service to impose measures on the Department of Transportation to mitigate the environmental impacts of a road project on endangered plants and animals and critical wildlife habitats. By locating rare species in the planning stage of road construction, these impacts can be avoided or minimized.

Historic Sites

The location of historic sites in Surry Count (See Figure 7) was investigated to determine the possible impact of the various projects studied. The federal government has issued guidelines requiring all State Transportation Departments to make special efforts to preserve historic sites. In addition, the State of North Carolina has issued its own guidelines for the preservation of historic sites. These two pieces of legislation are described below:

National Historic Preservation Act - Section 106 of this act requires the Department of Transportation to identify historic properties listed in the National Register of Historic Places and properties eligible to be listed. The DOT must consider the impact of its road projects on these properties and consult with the Federal Advisory Council on Historic Preservation.

NC General Statute 121-12(a) - This statute requires the DOT to identify historic properties listed on the National Register, but not necessarily those eligible to be listed. DOT must consider impacts and consult with the North Carolina Historical Commission, but is not bound by their recommendations.

Appendix A

Thoroughfare Plan Street Tabulation and Recommendations

This appendix includes a detailed tabulation of all roads identified as elements of the Surry County Thoroughfare Plan. Table A-1 includes a description of each road section, as well as the length, cross-section, and right-of-way for each section. Also included are existing and projected average weekday traffic volumes, roadway capacity, and the recommended ultimate lane configuration.

The following index of abbreviations may be helpful in interpreting the table:

- A through P - Codes referring to the typical cross sections
- UPB - Urban Planning Boundary
- CL - City Limits
- ADQ - Adequate
- UNK - Unknown
- Co - County
- LN - Lanes
- DL - Divided Lanes
- U - Indicates an Urban Section
- Rec - Recommendation
- EPAB - Eastern planning area boundary
- SPAB - South planning area boundary
- WPAB - West planning area boundary
- NPAB - North planning area boundary
- ADQ - 1993 and 2020 data from Mt Airy study and US 751
- ** - 2020 Data from the Pilot Mtn Thoroughfare Plan
- * - Coordinate with Mt Airy Thoroughfare Plan

Thoroughfare Plan Street Tabulation and Recommendation

ROADWAY	EXISTING CROSS SECTION			SPEED	DESIGN CAPACITY		1995 ADT	Italicized From Mt Airy model	(*corr. To MTP) RECOMMENDED CROSS SECTION	
	DIST	RDWY	ROW		LOS C	LOS D			RDWY	LETTER
SECTION	MI	LN-F	FT	mph	LOS C	LOS D	1995 ADT	2025 ADT	RDWY	LETTER
I-77										
Yadkin Co - US 21	0.87	4 - 48	290	70	47,300	58,400	29,000	59,200		ADQ
US 21 - ECL Elkin	0.14	4 - 48	290	70	47,300	58,400	20,100	39,325		ADQ
ECL Elkin - NC 89	13.6	4 - 48	390	70	47,300	58,400	17,000	37,500		ADQ
NC 89 - Virginia Line	4.42	4 - 48	390	70	47,300	58,400	19,000	42,700		ADQ
US 21										
Elkin NBPA- Wilkes Co	1.91	2 - 24	150	55	6,500	9,800	4,500	9,000		ADQ
US 52										
Stokes Co - NC 268	3.97	4 - 48	260	65	47,000	57,600	22,200	61,500**	72**	L**
NC 268 - US 52 Bus	8.09	4 - 48	260	65	47,000	57,600	20,000a	18,900a		ADQ
US 52 Bus-SSL Mt Airy	2.67	4 - 48	260	55		27,300a	25,200a	17,000a		ADQ
SSL Mt Airy - US 601	0.14	4 - 48	260	45		21,600a	22,000a	18,400a		ADQ
US 601 - NC 89	1.18	4 - 48	260	55		21,600a	24,100a	20,600a		ADQ
NC 89 - NCL Mt Airy	0.69	4 - 48	260	55		21,600a	19,000a	21,900a		ADQ
NCL Mt Airy-US 52 Bus	1.47	4 - 48	260	55		21,600a	17,400a	19,500a		ADQ
US 52 Bus-Virginia Line	4.20	4 - 48	260	65		37,000a	12,500a	13,200a		ADQ
US 601										
Yadkin Co-SR 2233	0.26	2 - 18	100	55	3,900	5,900	3,000	5,700	24	K
SR 2233-NC 268	2.51	2 - 18	60	55	3,900	5,900	3,000	5,700	24	K
NC 268-SR 1104	4.78	2 - 48	60	55	3,900	5,900	4,200	9,200		ADQ
SR 1104-SR 2258	2.57	2 - 48	60	55	6,500	9,800	5,700	13,300		ADQ
SR 2258-Mt Airy EPAB	4.13	2 - 48	60	55	6,500	9,800	9,200	17,500		ADQ

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Continued from A-2

ROADWAY	EXISTING CROSS SECTION			SPEED	DESIGN CAPACITY		1995 ADT	Italicized From Mt Airy model	(*corr. To MTP) RECOMMENDED CROSS SECTION	
	DIST	RDWY	ROW		LOS C	LOS D			RDWY	LETTER
SECTION	MI	LN-FT	FT	mph	LOS C	LOS D	1995 ADT	2025 ADT	RDWY	LETTER
US 601 Business										
US 601-SR 1001	1.66	2 - 24	60	35	6,500	9,800	8,100	13,000		ADQ
SR 1001-US 601	0.68	2 - 24	60	35	6,500	8,800	5,800	10,000		ADQ
NC 18										
NC 89-Allegany Co	0.18	2 - 20	100	55	4,500	7,000	900	2,100		ADQ
NC 89										
Stokes Co-Mt Airy WPBA	6.30	2 - 18	60	55	3,900	5,900	6,400a	10,500a	24	K*
Mt Airy WPAB-SR 1396	2.20	2 - 24	80	55	6,500	9,800	9,600	20,300	60	C
SR 1396-SR 1397	1.77	4 - 48	220	55		21,600	9,600	20,300		ADQ
SR 1397-SR 1338	1.74	2-18	60	55	3,900	5,900	4,400	8,100	24	K
SR 1338-NC 18	10.6	2 - 20	60-100	55	2,200	4,600	2,200	3,550	24	K
NC 18-Virginia Line	0.29	2 - 20	100	55	2,200	4,600	1,800	3,200	24	K
NC 103										
Virginia Line-Mt Airy WPAB	4.82	2 - 20	60	55	6,500	9,800	3,000a	6,000a	24	K*
NC 104										
SR 1723-Virginia Line	1.55	2 - 18	60	55	3,900	5,900	2500a	6,100a	24	K*
NC 268										
SR 1139-US 601	4.36	2 - 20	60	45	4,500	7,000	3,000	8,300	24	K
US 601-SR 1003	6.34	2 - 20	60	45	4,500	7,000	3,500	7,700	24	K
SR 1003-Ararat River	4.05	2 - 20	60	45	4,500	7,000	3,600	7,800	24	K
Ararat River-Pilot Mtn WCL	6.20	2 - 24	100	45	6,500	9,800	4,100	8,400	24	K
SR 1001										
US 601 Business I-77	3.81	2-22	60	55	5,100	7,800	5,500	12,000	60	C*
SR 1003										
NC 268-Mt Airy SPAB	5.90	2 - 20	60	55	4,500	7,000	2,900	5,900	24	K

Continued from page A-3

ROADWAY	EXISTING CROSS SECTION			SPEED	DESIGN CAPACITY		Italicized From Mt Airy model	(*corr. To MTP) RECOMMENDED CROSS SECTION			
	DIST	RDWY	ROW		LOS C	LOS D		1995 ADT	2025 ADT	RDWY	LETTER
	SECTION	MI	LN-FT								
SR 1345											
US 601 Business-NC 89	4.10	2 - 20	60	55	4,500	7,000	2,100	3,300	24	K	
SR 1350											
SR 1359-SR 1356	1.00	2 - 20	NA	55	4,500	7,000	2,700	4,950	24	K	
SR 1356-SR 1345	4.06	2 - 20	NA	55	4,500	7,000	2,700	4,950	24	K	
SR 1395											
NC 89-SR 1350	1.02	2 - 20	60	45	4,500	7,000	3,500	7,500	24	K	
SR 1809											
NC 89-SR 1857	6.53	2 - 20	NA	55	4,500	7,000	2,700	6,500	24	K	

Typical Cross Sections

Cross section requirements for thoroughfares vary according to the desired capacity and level of service to be provided. Universal standards in design of thoroughfares are not practical. Each section of road must be individually analyzed and its cross section requirements determined on the basis of amount and type of projected traffic, existing capacity, desired level of service, and available right-of-way. Typical cross sections recommended by the Statewide Planning Branch are shown in Figure A-1. These cross sections are typical for facilities at new locations and where right-of-way constraints are not critical. For widening projects and urban projects with limited right-of-way, special cross-sections should be developed that meet the needs of the project.

The recommended typical cross sections shown in Table A-1 were derived on the basis of projected traffic, existing capacities, desirable levels of service, and available right-of-way.

On all existing and proposed major thoroughfares delineated on the thoroughfare plan, adequate right-of-way should be protected or acquired for the ultimate cross sections. Ultimate desirable cross sections for each of the thoroughfares are listed here. Recommendations for "ultimate" cross sections are provided for the following:

1. thoroughfares which may require widening after the current planning period;
2. thoroughfares which are borderline adequate, where accelerated traffic growth could render them deficient; and
3. thoroughfares where an urban curb and gutter cross section may be locally desirable because of urban development or redevelopment.

A - Four Lanes Divided with Median, Freeway

This cross section is typical for four-lane divided highways in rural areas, which may have only partial or no control of access. The minimum median width for this cross section is 46 feet, but a wider median is desirable.

B - Seven Lanes, Curb & Gutter

This cross section "B" is not recommended for new projects. When the conditions warrant six lanes, cross section "D" should be recommended. Cross section "B" should be used only in special situations such as widening from a five-lane section when right-of-way is limited. Even in these situations, consideration should be given to converting the center turn lane to a median so that cross section "D" is the final cross section.

C - Five Lanes, Curb & Gutter

Typical for major thoroughfares, this cross section is desirable where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

D - Six Lanes Divided with Raised Median, Curb & Gutter/E-Four Lanes Divided with Raised Median, Curb & Gutter

Cross section "D" and "E" are typically used on major thoroughfares where left turns and intersection streets are not as frequent. Left turns would be restricted to a few selected inter-sections. The 16 ft median is the minimum recommended for an urban boulevard type cross section. In most instances, monolithic construction should be utilized due to greater cost effectiveness, ease and speed of placement, and reduced future maintenance requirements. In special cases, grassed or landscaped medians result in greatly increases maintenance costs and an in-creased danger to maintenance personnel. Non-monolithic medians should only be recommended when the above concerns are addressed.

F - Four Lanes Divided, Boulevard, Grass Median

Recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 24 ft is recommended with 30 ft being desirable.

G - Four Lanes, Curb & Gutter

Cross section "G" is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would probably be required at major intersections. This cross section should be used only if the above criteria is met. If right-of-way

is not restricted, future strip development could take place and the inner lanes could become de facto left turn lanes.

H - Three Lanes, Curb & Gutter

In urban environments, thoroughfares which are proposed to function as one-way traffic carriers would typically require this cross section.

I - Two Lanes, Curb & Gutter with Parking on Both Sides : J - Two Lanes, Curb & Gutter with Parking on One Side

Cross sections "I" and "J" are usually recommended for urban minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross section "I" would be used on those minor thoroughfares where parking on both sides is needed as a result of more intense development.

K - Two Lanes, Paved Shoulder

This cross section "K" is used in rural areas or for staged construction of a wider multi-lane cross section. On some thoroughfares, projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time. For areas that are growing and future widening will be necessary, the full right-of-way of 100 ft should be required. In some instances, local ordinances may not allow the full 100 ft. In those cases, 70 ft should be preserved with the understanding that the full 70 ft will be reserved by use of building setbacks and future street line ordinances.

L - Six Divided with Grass Median, Freeway

Cross section "L" is typical for controlled access freeways. The 46 ft grassed median is the minimum desirable median width, but there could be some variation from this depending upon design considerations. Right-of-way requirements would typically vary upward from 228 ft depending upon cut and fill requirements.

M - Eight Lanes Divided with Raised Median, Curb & Gutter

Also used for controlled access freeways, this cross section may be recommended for freeways going through major urban areas or for routes projected to carry very high volumes of traffic.

N - Five Lanes, Curb & Gutter, Widened Curb Lanes; O - Two Lane/Shoulder Section; P - Four Lane Divided/ Raised Median, C & G, Widened Curb Lanes

If there is sufficient bicycle travel along the thoroughfare to justify a bicycle lane or bikeway, additional right-of-way may be required to contain the bicycle facilities. The North Carolina Bicycle Facilities Planning and Design Guidelines should be consulted for design standards for

bicycle facilities. Cross sections “N”, “O”, and “P” are typically used to accommodate bicycle travel.

Other General Information

The urban curb & gutter cross sections illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk farther away from the street to provide additional separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

The rights-of-way shown for the typical cross sections is the minimum amount required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill may require either additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

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Appendix B

Thoroughfare Planning Principles

There are many advantages to thoroughfare planning, but the primary mission is to assure that the road system will be progressively developed to serve future travel desires. Thus, the main consideration in thoroughfare planning is to make provisions for street and highway improvements so that, when the need arises, feasible opportunities to make improvements exist.

Benefits of Thoroughfare Planning

There are two major benefits derived from thoroughfare planning. First, each road or highway can be designed to perform a specific function and provide a specific level of service. This permits savings in right-of-way, construction, and maintenance costs. It also protects residential neighborhoods and encourages stability in travel and land use patterns. Second, local officials are informed of future improvements and can incorporate them into planning and policy decisions. This will permit developers to design subdivisions in a non-conflicting manner, direct school and park officials to better locate their facilities, and minimize the damage to property values and community appearance that is sometimes associated with roadway improvements.

County Thoroughfare Planning Concepts

The underlying notion of the thoroughfare plan is to provide a functional system of streets, roads, and highways that permit direct, efficient, and safe travel. Different elements in the system are designed to have specific functions and levels of service, thus minimizing the traffic and land service conflict.

In the county plan, elements are either urban or rural. In the urban planning area, the local municipality generally has planning jurisdiction. Outside the urban planning area, the county has planning jurisdiction. In those areas where no urban thoroughfare plan exists, elements are rural and are under the planning jurisdiction of the county.

Within the urban and rural systems, plan elements are classified according to the specific function they are to perform. A discussion of the elements and functions of the two systems follows.

Rural Thoroughfare Classification System

Streets perform two primary functions, traffic service and land access. When combined, these two functions are basically incompatible. The conflict is not serious if both traffic demands and land service demands are low. However, when traffic volumes are high, conflicts created by uncontrolled and intensely developed abutting property lead to intolerable traffic flow friction and congestion.

The thoroughfare plan provides a functional system of streets that permit travel from origins to destinations with directness, ease, and safety. Different streets in this system are designed to perform specific functions, thus minimizing the traffic and land service conflict.

In county thoroughfare planning, there are four major systems: principal arterials, minor arterials, major and minor collectors, and local roads.

Principal Arterial System

This system is a connected network of continuous routes that serve corridor movements having substantial statewide or interstate travel characteristics. This is shown by both the trip lengths and the travel densities. The principal arterial system serves all urban areas of over 50,000 population and most of those with a population greater than 5,000. The interstate system constitutes a significant portion of the principal arterial system.

Minor Arterial System

This system forms a network that links cities, larger towns, and other major traffic generators such as large resorts. The minor arterial system generally serves intrastate and intercounty travel and travel corridors with trip lengths and travel densities somewhat less than the principal arterial system.

Collector Road System

The rural collector routes generally serve intracounty travel. These routes serve travel with distances that are shorter than on the arterial routes. The rural collector road system is subclassified into major and minor collector roads.

Major Collector Roads: These routes provide service to the larger towns not directly served by the higher systems and to other traffic generators of equivalent intracounty importance, such as consolidated schools, shipping points, county parks, significant mining and agricultural areas, etc. Major collector roads also link these places to routes of higher classification and serve the more important intracounty travel corridors.

Minor Collector Roads: These facilities collect traffic from local roads and bring all developed areas within a reasonable distance of a major collector road. They also provide service to the remaining smaller communities and link the locally important traffic generators with the rural outskirts.

Local Road System

The local roads are all roads that are not on a higher system. Local residential subdivision streets and residential collector streets are elements of the local road system. Local residential streets include cul-de-sacs, loop streets less than 2,500 feet in length, or streets less than 1.0 mile in length. They do not connect thoroughfares or serve major traffic generators and typically do not collect traffic from more than one hundred dwelling units. Residential collectors serve as the connecting street system between local residential streets and the thoroughfare system.

Figure B-1 provides a schematic illustration of a functionally classified rural highway system. The functional classification of roads in Surry County is shown in Figure B-2.

Objectives of Thoroughfare Planning

Thoroughfare planning is the process public officials use to assure the development of the most appropriate street system to meet the existing and future travel desires within the area. The primary aim of a thoroughfare plan is to guide the development of the road system in a manner consistent with changing traffic demands. Through proper planning for road development, costly errors and needless expense can be averted. A thoroughfare plan will enable road improvements to be made as traffic demand increases, and help eliminate unnecessary improvements. By developing the street system to keep pace with increasing traffic demands, maximum utilization of the system can be attained that will require a minimum amount of land for roads.

In addition to providing for traffic needs, the thoroughfare plan should embody those details of good urban planning necessary to present a pleasing and efficient urban community. The location of present and future population, commercial, and industrial enterprises affects major street and highway locations. Conversely, the location of major streets and highways within the urban area will influence the urban development pattern.

Other objectives of a thoroughfare plan include:

- providing for the development of an adequate major street system as land development occurs;
- reducing travel and transportation costs;
- reducing the cost of major street improvements to the public through the coordination of street systems with private actions;
- enabling private interests to plan their actions, improvements, and development with full knowledge of public intent;
- minimizing disruption and displacement of people and businesses through long range planning for major street improvements;
- reducing environmental impacts such as air pollution, resulting from transportation; and
- increasing travel safety.

These objectives are achieved through improving both the operational efficiency of thoroughfares, and improving the system efficiency by system coordination and layout.

Operational Efficiency

A street's operational efficiency is improved by increasing the capability of the street to carry vehicular traffic and people. In terms of vehicular traffic, a street's capacity is the maximum number of vehicles that can pass a given point on a roadway during a given period under prevailing roadway and traffic conditions. The physical features of the roadway, nature of traffic, and weather affect capacity.

Physical ways to improve vehicular capacity include:

- *Street widening* - Widening a street from two to four travel lanes, can more than double the capacity of the roadway because additional maneuverability for the traffic is provided.
- *Intersection improvements* - Increasing the turning radii, adding exclusive turn lanes, and channeling conflicting traffic movements can improve the capacity of an existing intersection.
- *Improvements to vertical and horizontal alignment* - These improvements can reduce the congestion caused by slow moving vehicles.
- *Elimination of roadside obstacles* - This can reduce side friction and improve a driver's field of sight.

Operational ways to improve street capacity include:

- *Control of access* - A roadway with complete access control can often carry three times the traffic handled by a non-controlled access street with identical lane width and number.
- *Parking relocation* - Relocating on-street parking to an off-street site increases capacity by providing additional street width for traffic flow and reducing the friction to traffic flow caused by parking and unparking vehicles
- *One-way operation* - The capacity of a street can sometimes be increased 20-50%, depending upon turning movements and street width, by initiating one-way traffic operations. One-way streets also can improve traffic flow by decreasing potential traffic conflicts and simplifying traffic signal coordination.
- *Reversible lanes* - Reversible traffic lanes may be used to increase street capacity in situations where heavy directional flows occur during peak periods or special events.
- *Signal phasing and coordination* - Uncoordinated signals and poor signal phasing restrict traffic flow by creating excessive stop-and-go operation.

Altering travel demand is a third way to improve the efficiency of existing streets. Travel demand can be reduced or altered in the following ways:

- *Carpools* - Encouraging people to form carpools and van pools for journeys to work and other trip purposes reduces the number of vehicles on the roadway and raises the people-carrying capability of the street system
- *Alternate modes* - Encouraging the use of alternate modes of travel such as transit, bicycles, or walking for short trips can reduce demand on the roadways.
- *Work hours* - Encourage industries, business, and institutions to stagger work hours or establish variable work for employees. This will reduce travel demand in peak periods and spread peak travel over a longer period.
- *Land use* - Plan and encourage land use development or redevelopment in a more travel efficient manner.

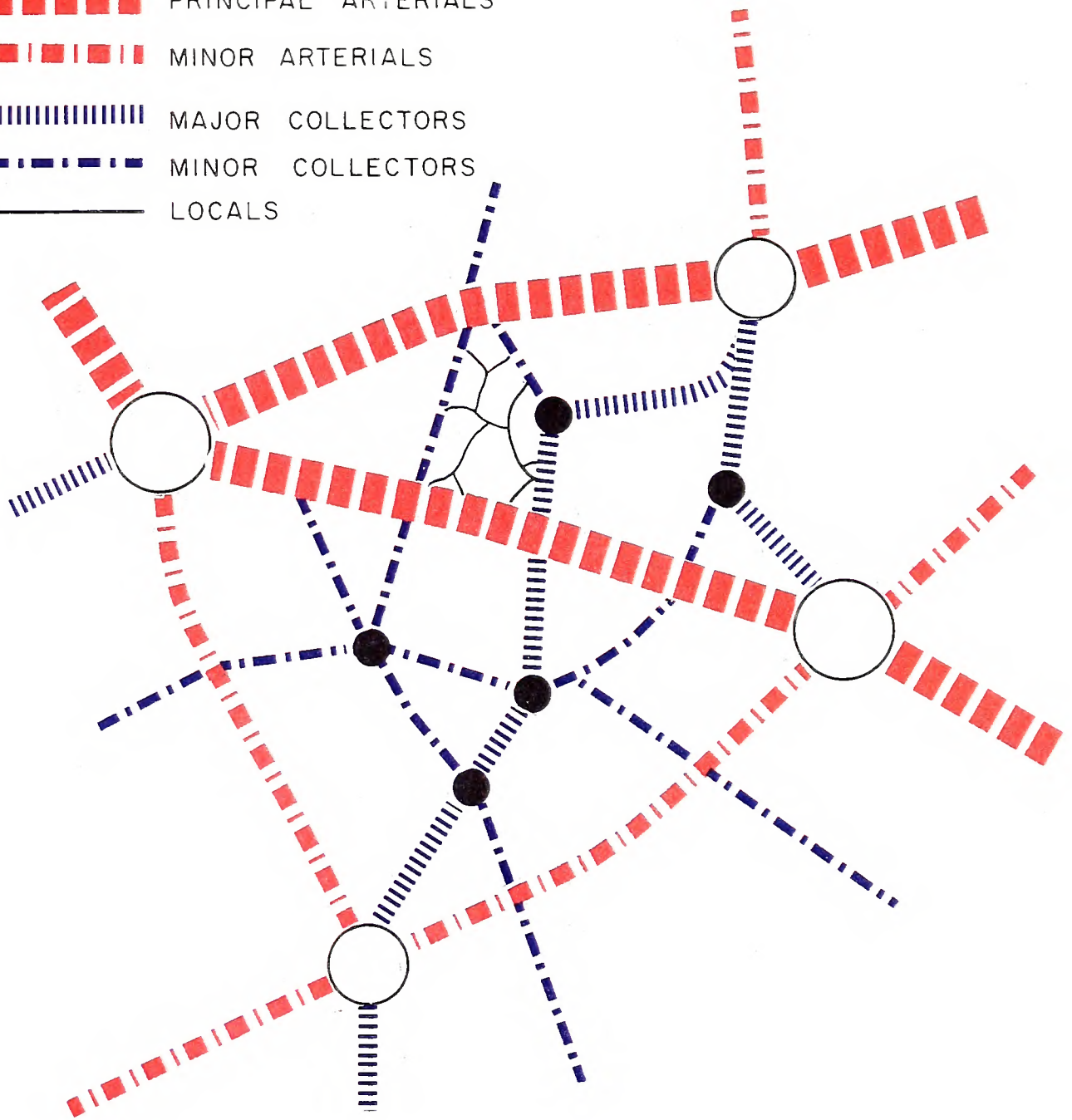
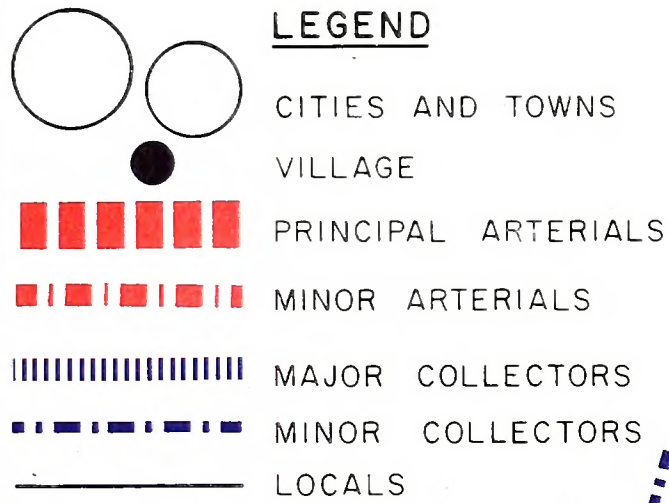
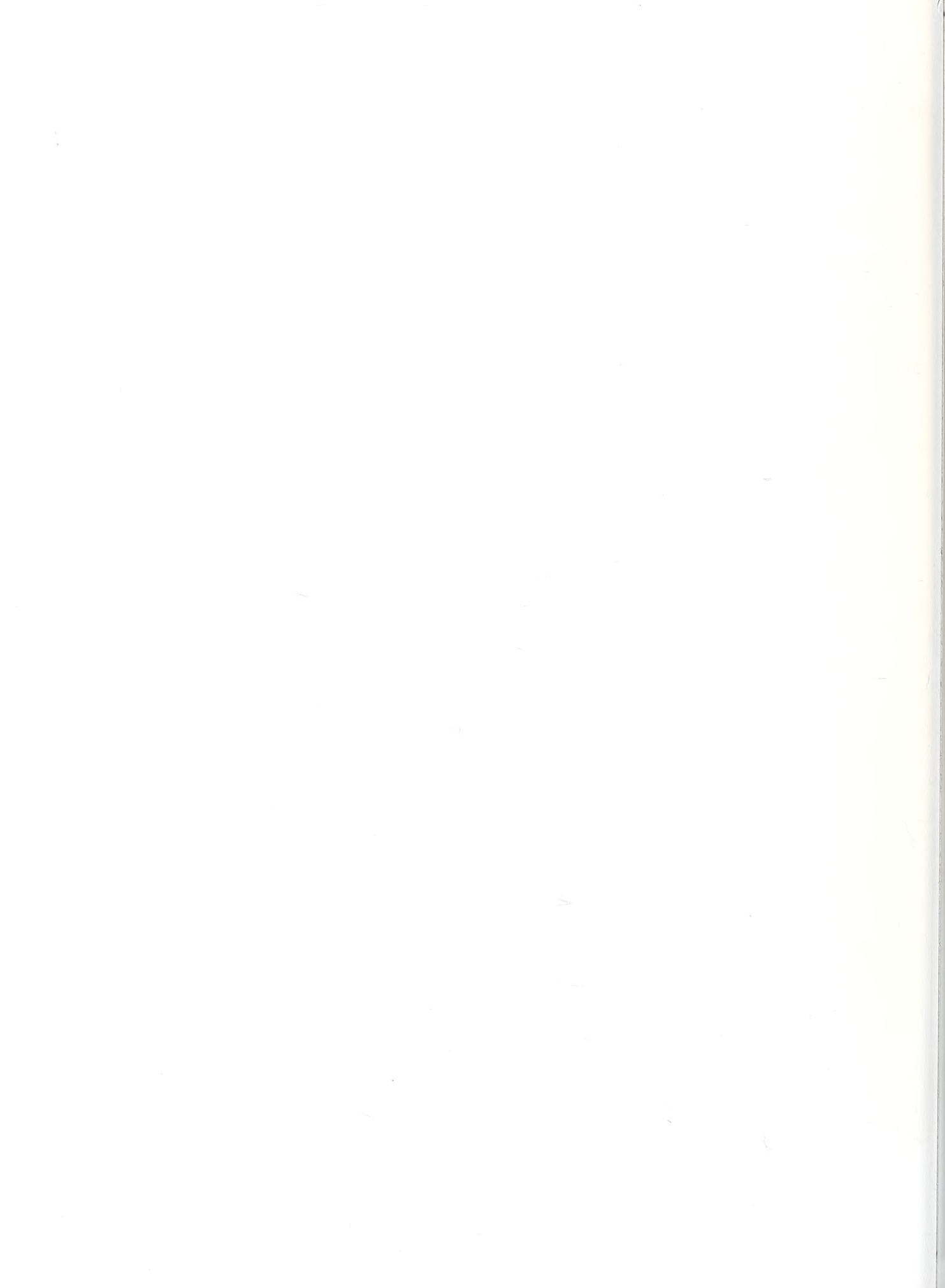
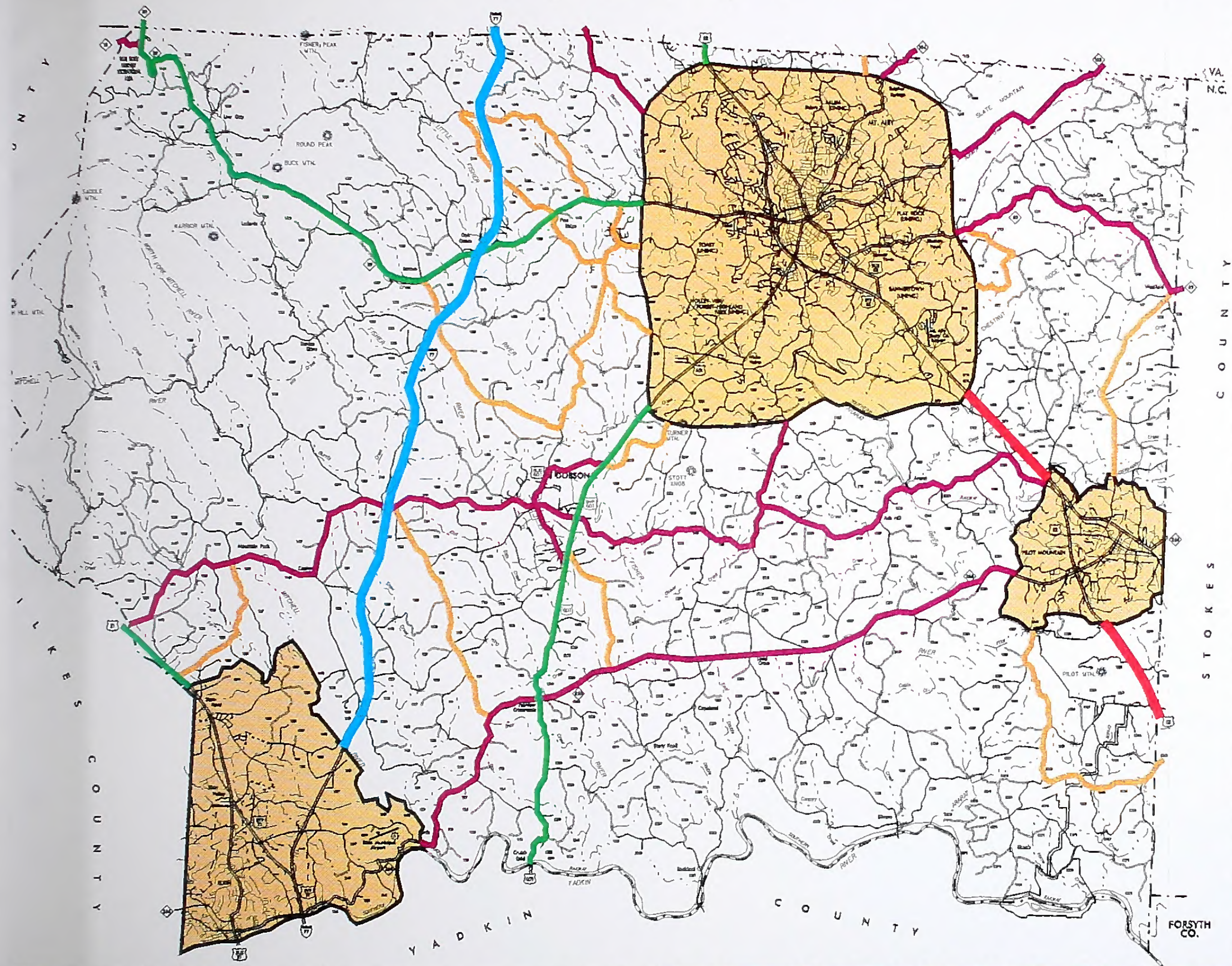


Figure B-1

SCHEMATIC ILLUSTRATION
OF FUNCTIONALLY CLASSIFIED
RURAL HIGHWAY NETWORK



FUNCTIONAL CLASSIFICATION



- Interstate █
- Other Principal Arterial █
- Minor Arterial █
- Major Collector █
- Minor Collector █
- Planning Area Boundary



SURRY COUNTY
NORTH CAROLINA

REVISED BY THE
 NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS - STATEWIDE PLANNING BRANCH
 IN COOPERATION WITH THE
 U.S. DEPARTMENT OF TRANSPORTATION
 FEDERAL HIGHWAY ADMINISTRATION



FIGURE B-2

System Efficiency

Another means of altering travel demand is the development of a more efficient system of streets that will better serve travel desires. A more efficient system can reduce travel distances, time, and cost. Improvements in system efficiency can be achieved through the concept of functional classification of streets and development of a coordinated major street system.

Application of Thoroughfare Planning Principles

The concepts presented in the discussion of operational efficiency, system efficiency, functional classification, and idealized major thoroughfare system are the conceptual tools available to the transportation planner in developing a thoroughfare plan. In actual practice, thoroughfare planning is done for established areas and is constrained by existing land use and street patterns, existing public attitudes and goals, and current expectations of future land use. Compromises must be made because of these and the many other factors that affect major road locations.

Through the thoroughfare planning process, it is necessary from a practical viewpoint that certain basic principles be followed as closely as possible. These principles are listed below:

1. The plan should be derived from a thorough knowledge of today's travel - its component parts, and the factors that contribute to it, limit it, and modify it.
2. Traffic demands must be sufficient to warrant the designation and development of each major road. The thoroughfare plan should be designed to accommodate a large portion of major traffic movements on a few roads.
3. The plan should conform to and provide for the land development plan for the area.
4. Certain considerations must be given to development beyond the current planning period. Particularly in outlying or sparsely developed areas that have development potential, it is necessary to designate thoroughfares on a long-range planning basis to protect rights-of-way for future thoroughfare development.
5. While being consistent with the above principles and realistic in terms of travel trends, the plan must be economically feasible.

Appendix C

Benefits Analysis

Reduced road user costs should result from any roadway improvement, from a simple widening to the construction of a new roadway to relieve congested or unsafe conditions. Comparisons of the existing and the proposed facilities have been made in terms of vehicle operating costs, travel time costs, and accident costs. These user benefits are computed as total dollar savings over the design period using data such as project length, base year and design year traffic volumes, traffic speed, type of facility, and volume/capacity ratio.

The impact of a project on economic development potential is shown as the probability that it will stimulate the economic development of an area by providing access to developable land and reducing transportation costs. It is a subjective estimate based on the knowledge of the proposed project, local development characteristics, and land development potential. The probability is rated on a scale from 0 (representing no development potential) to 1.00 (representing excellent development potential).

The environmental impact analysis considers the effect of a project on the physical, social/cultural, and economic environment. Below is a list of the items that are considered when evaluating the impacts on the environment.

Table C-1

Environmental Considerations		
Physical Environment	Social and Cultural Environment	Economic Environment
Air quality Water Resources Soils and Geology Wildlife Vegetation	Housing Neighborhoods Noise Educational Facilities Churches Parks/Recreational Facilities Public Health and Safety National Defense Aesthetics	Businesses Employment Economic Development Public Utilities Transportation Costs Capital Costs Operation/Maintenance Costs

The environmental impact analysis also uses a probability rating from 0 to 1.00. A negative value is assigned to the probability to indicate a negative impact. The summation of both positive and negative impact probabilities with respect to these factors provides a measure of the relative environmental impacts of a project. Table C-2 shows the probability scale used in the analysis. This table can be used as a guideline for interpreting the "Economic Development" and "Environmental Impact" values given in Table C-3.

Table C-2

Impact	Probability
High	1.00
Significant	0.75
Moderate	0.50
Slight	0.25
None	0.00

Offsetting the benefits that would be derived from any project is the cost of its construction. A new facility, despite its high projected benefits, might prove to be unjustified due to the excessive costs involved in construction. The highway costs estimated in this report were derived from the projected project costs identified in the 1996-2003 Transportation Improvement Program. The anticipated right-of-way costs were broken out of the project costs using an average cost per acre for property throughout Surry County according to the respective project. Table C-3 provides a breakdown of total project costs into construction costs and right-of-way costs for the major project proposals for the Thoroughfare Plan.

Table C-3

Benefits Evaluation of Selected Thoroughfare Plan Projects					
Project Description	Total Length (Miles)	25-year Accrued Benefits (\$ Millions)	Project Cost (\$ Construction) (\$ R/W)	Econ. Development Potential	Enviro. Impact Prob.
NC 89 (from Mt. Airy to SR 1399, Oak Grove Church Road, 5 lanes)	4.0	\$65,587,000	\$13,013,000 \$100,000	0.75	+0.20 -0.10
NC 268 (From Market St. to SR 1144, 5 lanes)	1.4	\$6,316,000	\$2,817,000 \$36,000	0.75	+0.20 -0.10
NC 268 (From SR 1144 To SR 2048)	24.5	\$64,141,000	\$27,227,000 \$612,500	0.25	+0.25 -0.20
SR 1001 (From I-77 to Dobson)	3.9	\$18,427,000	\$12,263,000 \$149,200	0.30	+0.30 -0.25
SR 1003 (From NC 268 To SR 2258)	6.4	\$16,256,000	\$7,068,000 \$159,000	0.15	+0.20 -0.10
NC 89 (From Stokes Co. to Mt. Airy)	7.4	\$16,704,000	\$8,180,000 \$184,000	0.25	+0.40 -0.15
NC 89 (From SR 1399 To Virginia Border)	12.3	\$38,531,000	\$13,636,000 \$306,750	0.15	+0.5 0.10
US 1345 (From NC 89 To US 601 Business)	5.1	\$7,854,000	\$5,712,000 \$128,500	0.20	+0.40 -0.10
SR 1350 (NC 89 to SR 1345)	6.8	\$14,531,000	\$7,590,000 \$170,500	0.30	+0.40 -0.15

Table C-3 Continued

Project Description	Total Length (Miles)	25-year Accrued Benefits (\$ Millions)	Project Cost (\$ Construction) (\$ R/W)	Econ. Development Potential	Enviro. Impact Prob.
US 601 (From Yadkin Co. to NC 268)	4.3	\$9,565,000	\$4,790,000	0.15	+0.35 -0.25
SR 1809 (From NC 89 To Pilot Mountain, NC 268)	6.1	\$16,201,000	\$6,823,000 \$153,500	0.30	+0.35 -0.15
NC 103 (From Mt. Airy to Virginia Line)	4.3	\$11,200,000	\$4,790,000 \$107,750	0.50	+0.40 -0.10

Appendix D

Recommended Subdivision Ordinances

Streets and Roads

Rural Roads

1. *Principal Arterial* - A rural link in a highway system serving travel, and having characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of Interstate routes and other routes designated as principal arterials.
2. *Minor Arterial* - A rural roadway joining cities and larger towns and providing intra-state and inter-county service at relatively high overall travel speeds with minimum interference to through movement.
3. *Major Collector* - A road which serves major intra-county travel corridors and traffic generators and provides access to the Minor Arterial system.
4. *Minor Collector* - A road which provides service to small local communities and traffic generators and provides access to the Major Collector system.
5. *Local Road* - A road which serves primarily to provide access to adjacent land, over relatively short distances.

Urban Streets

1. *Major Thoroughfares* - Major thoroughfares consist of inter-state, other freeway, expressway, or parkway roads, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.
2. *Minor Thoroughfares* - Minor thoroughfares perform the function of collecting traffic from local access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating minor through traffic movements and may also serve abutting property.
3. *Local Street* - A local street is any street not on a higher order urban system and serves primarily to provide direct access to abutting land.

Specific Type Rural or Urban Streets

1. *Freeway, expressway, or parkway* - Divided multi-lane roadways designed to carry large volumes of traffic at high speeds. A *freeway* provides for continuous flow of vehicles with no direct access to abutting property and with access to selected crossroads only by way of

interchanges. An *expressway* is a facility with full or partial control of access and generally with grade separations at major intersections. A *parkway* is for non-commercial traffic, with full or partial control of access.

2. *Residential Collector Street* - A local street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.
3. *Local Residential Street* - Cul-de-sacs, loop streets less than 2500 feet in length, or streets less than 1.0 mile in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.
4. *Cul-de-sac* - A short street having only one end open to traffic and the other end being permanently terminated and a vehicular turn around provided.
5. *Frontage Road* - A road that is parallel to a partial or full access controlled facility and provides access to adjacent land.
6. *Alley* - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the backside of properties otherwise abutting on a street.

Property

Building Setback Line

A line parallel to the street in front of which no structure shall be erected.

Easement

A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

Lot

A portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership or for development or both. (Also includes "plat" and "parcel").

Subdivision

Subdivider-Any person, firm, corporation, or official agent thereof, who subdivides or develops any land deemed to be a subdivision.

All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development and all divisions of land involving the dedication of a new street or change in existing streets.

The following shall not be included within this definition nor subject to these regulations:

- The combination or re-combination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein
- the division of land into parcels greater than ten acres where no street right-of-way dedication is involved
- the public acquisition, by purchase, of strips of land for the widening or the opening of streets, and
- the division of a tract in single ownership whose entire area is no greater than 2 acres into more than three lots, where no street right-of-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.
- Dedication-A gift, by the owner, of his property to another party without any compensation being given for the transfer. The dedication is made by written instrument and completed with an acceptance.
- Reservation-Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep property free from development for a stated period of time.

Roadway Design Standards

The design of all roads within the Planning Area shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway Officials (AASHTO) manuals.

The provision of street rights-of-way shall conform and meet the recommendations of the Thoroughfare Plan, as adopted. The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally, the proposed streets should be the extension of existing streets if possible.

Right-of-Way Widths

Right-of-way (ROW) widths shall not be less than the following and shall apply except in those cases where ROW requirements have been specifically set out in the Thoroughfare Plan.

The subdivider will only be required to dedicate a maximum of 100 feet of ROW. In cases where over 100 feet of ROW is desired, the subdivider will be required only to reserve the amount in excess of 100 feet. In all cases in which ROW is sought for a fully controlled access facility, the subdivider will only be required to make a reservation. It is strongly recommended that subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principal and minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width ROW, not less than 60 feet in width, may be dedicated when adjoining undeveloped property that is owned or controlled by the subdivider; provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is subdivided, the remainder of the full required ROW shall be dedicated.

Table D-1

Minimum Right-of-Way Requirements		
Area Classification	Functional Classification	Minimum ROW
RURAL	Principal Arterial	Freeways: 350 ft Other: 200 ft
	Minor Arterial	100 ft
	Major Collector	100 ft
	Minor Collector	80 ft
	Local Road	60 ft
URBAN	Major Thoroughfare	90 ft
	Minor Thoroughfare	70 ft
	Local Street	60 ft
	Cul-de-sac	variable ²

¹ The desirable minimum right-of-way (ROW) is 60 ft. If curb and gutter is provided, 50 ft is Adequate on local residential streets.

² The ROW dimension will depend on the radius used for vehicular turn around. Distance from edge of pavement of turn around to ROW should not be less than distance from edge of pavement to ROW on street approaching turn around.

Street Widths

Widths for street and road classifications other than local shall be as recommended by the Thoroughfare Plan. Width of local roads and streets shall be as follows:

1. Local Residential

- Curb & Gutter section: 26 feet, face to face of curb
- Shoulder section: 20 feet to edge of pavement, 4 feet for shoulders

2. Residential Collector

- Curb & Gutter section: 34 feet, face to face of curb
- Shoulder section: 20 feet to edge of pavement, 6 feet for shoulders

Geometric Characteristics

The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under *Right-of-Way* shall apply.

1. *Design Speed* - The design speed for a roadway should be a minimum of 5 mph greater than the posted speed limit. The design speeds for subdivision type streets are shown in Table D-2.

2. *Minimum Sight Distance* - In the interest of public safety, no less than the minimum sight distance applicable shall be provided. Vertical curves that connect each change in grade shall be provided and calculated using the parameters set forth in Table D-3.
3. *Superelevation* - Table D-4 shows the minimum radius and the related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.
4. *Maximum and Minimum Grades*
 - the maximum grades in percent are shown in Table D-5
 - minimum grade should not be less than 0.5%
 - grades for 100 feet each way from intersections (measured from edge of pavement) should not exceed 5%

Table D-2

Design Speeds			
Facility Type	Desirable	Minimum	
		Level	Rolling
RURAL			
Minor Collector Roads (ADT Over 2000)	60	50	40
Local Roads ¹ (ADT Over 400)	50	*50	*40
URBAN			
Major Thoroughfares ²	60	50	40
Minor Thoroughfares	40	30	30
Local Streets	30	**30	**20

Note * Based on ADT of 400-750. Where roads serve a limited area and small number of units, can reduce minimum design speed. **Based on projected ADT of 50-250. (Reference NCDOT Roadway Design Manual page 1-1B)

¹ Local Roads include Residential Collectors and Local Residential

² Major Thoroughfares other than Freeways or Expressways

Intersections

1. Streets shall be laid out so as to intersect as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixty-five (65) degrees.
2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the

property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.

3. Offset intersections are to be avoided. Intersections which cannot be aligned should be separated by a minimum length of 200 feet between survey centerlines.

Cul-de-sacs

Cul-de-sacs shall not be more than 500 feet in length. The distance from the edge of pavement on the vehicular turn around to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turn around. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

Table D-3
Sight Distance

Design Speed (mph)	Stopping Sight Distance (feet)		Minimum K ¹ Values (feet)		Passing Sight Distance (ft) for 2-lanes
	Desirable	Minimum	Crest Curve	Sag Curve	
30	200	200	30	40	1100
40	325	275	60	60	1500
50	475	400	110	90	1800
60	650	525	190	120	2100

Note: General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case.

¹ K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length of the vertical curve, which will provide the desired sight distance. Sight distance provided for stopped vehicles at intersections should be in accordance with "A Policy on Geometric Design of Highways and Streets, 1990."

Table D-4

Design Speed (km/h)	Superelevation Table Minimum Radius of Maximum e ¹		
	e = 0.04	e = 0.06	e = 0.08
30	302	273	260
60	573	521	477
80	955	955	819
100	1,637	1,432	1,146

¹ e = Rate of roadway superelevation foot per foot

Note: Reference NCDOT Roadway Design Manual, page 1-12 T-6 through T-8

Table D-5

Maximum Vertical Grade				
Facility Type	Design Speed (mph)	Minimum Grade in Percent		
		Flat	Rolling	Mountainous
RURAL				
Minor Collector Roads *	20	7	10	12
	30	7	9	10
	40	7	8	10
	50	6	7	9
	60	5	6	8
	70	4	5	6
Local Roads * ¹	20	--	11	16
	30	7	10	14
	40	7	9	12
	50	6	8	10
	60	5	6	--
URBAN				
Major Thoroughfares ²	30	8	9	11
	40	7	8	10
	50	6	7	9
	60	5	6	8
Minor Thoroughfares *	20	9	12	14
	30	9	11	12
	40	9	10	12
	50	7	8	10
	60	6	7	9
	70	5	6	7
Local Streets *	20	--	11	16
	30	7	10	14
	40	7	9	12
	50	6	8	10
	60	5	6	--

* For streets and roads with projected annual average daily traffic less than 250 or short grades less than 500 ft long, grades may be 2% steeper than the values in the above table. (Reference NCDOT Roadway Metric Design Manual, page 1-12 T-3)

¹ Local Roads including Residential Collectors and Local Residential.

² Major Thoroughfares other than Freeways or Expressways.

Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provisions are made for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.

2. The width of an alley shall be at least 20 feet.
3. Dead-end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn around facilities at the dead-end as may be required by the Planning Board.

Permits for Connection to State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the District Engineer of the Division of Highways.

Offsets to Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 30 feet from the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 6 feet from the face of curb.

Wheel Chair Ramps

All street curbs being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason, shall provide wheelchair ramps for the physically handicapped at intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

Horizontal Width on Bridge Deck

1. The clear roadway widths for new and reconstructed bridges serving 2-lane, two-way traffic should be as follows:
 - shoulder section approach:
 - ◆ under 800 ADT design year - minimum 28 feet width, face to face of parapets or rails, or pavement width plus 10 feet, whichever is greater.
 - ◆ 800 - 2000 ADT design year - minimum 34 feet width, face to face of parapets or rails, or pavement width plus 12 feet, whichever is greater.
 - ◆ over 2000 ADT design year - minimum width of 40 feet, desirable width of 44 feet width face to face of parapets or rails
 - curb and gutter approach:
 - ◆ under 800 ADT design year - minimum 24 feet face to face of curbs.
 - ◆ over 800 ADT design year - width of approach pavement measured face to face of curbs.
 - Where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face curbs, and in crown drop. The distance from face of curb to face of parapet or rail shall be a minimum of 1.5 feet, or greater if sidewalks are required.

2. The clear roadway widths for new and reconstructed bridges having 4 or more lanes serving undivided two-way traffic should be as follows:

- shoulder section approach - width of approach pavement plus width of usable shoulders on the approach left and right (shoulder width 8 feet minimum, 10 feet desirable).
- curb and gutter approach - width of approach pavement measured face to face of curbs.

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Appendix E

Level of Service Definitions

The various levels of service are defined below for uninterrupted flow facilities, but the basic concepts apply to all roads. These levels of service are illustrated in Figure E-1.

LOS A

Represents free flow. Individual users are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to maneuver within the traffic stream is extremely high. The general level of comfort and convenience provided to the motorist, passenger, or pedestrian is excellent.

LOS B

Is in the range of stable flow, but the presence of other users in the traffic stream begins to be noticeable. Freedom to select desired speeds is relatively unaffected, but there is a slight decline in the freedom to maneuver within the traffic stream from LOS A. The level of comfort and convenience provided is somewhat less than at LOS A, because the presence of others in the traffic stream begins to affect individual behavior.

LOS C

Is in the range of stable flow, but marks the beginning of the range of flow in which the operation of individual users becomes significantly affected by interactions with others in the traffic stream. The selection of speed is now affected by the presence of others, and maneuvering within the traffic stream requires substantial vigilance on the part of the user. The general level of comfort and convenience declines noticeably in this range.

LOS D

Represents high-density, but stable, flow. Speed and freedom to maneuver are severely restricted, and the driver or pedestrian experiences a generally poor level of comfort and convenience. Small increases in traffic flow will generally cause operational problems at this level.

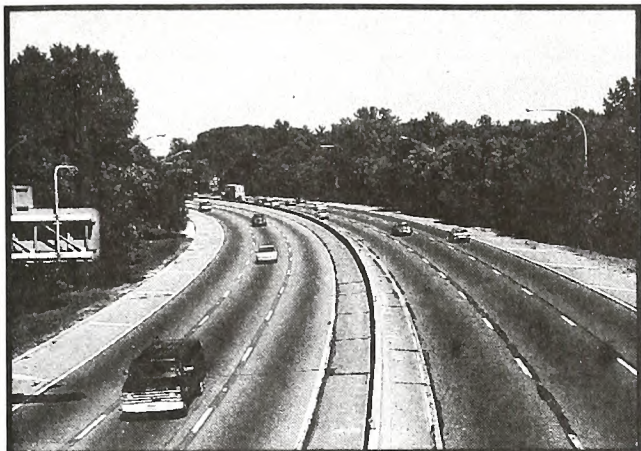
LOS E

Represents operating conditions at or near the capacity level. All speeds are reduced to a low, but relatively uniform value. Freedom to maneuver within the traffic stream is extremely difficult, and it is generally accomplished by forcing a vehicle or pedestrian to "give way" to accommodate such maneuvers. Comfort and convenience levels are extremely poor, and driver or pedestrian frustration is generally high. Operations at this level are usually unstable, because small increases in flow or minor perturbations within the traffic stream will cause breakdowns.

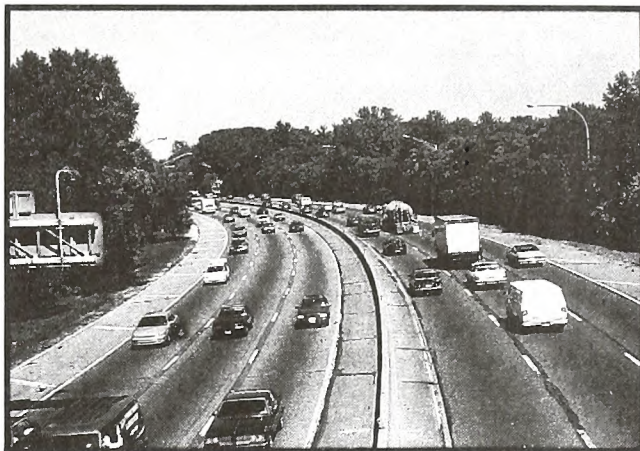
LOS F

Is used to define forced or breakdown flow. This condition exists wherever the amount of traffic approaching a point exceeds the amount which can traverse the point. Queues form behind such

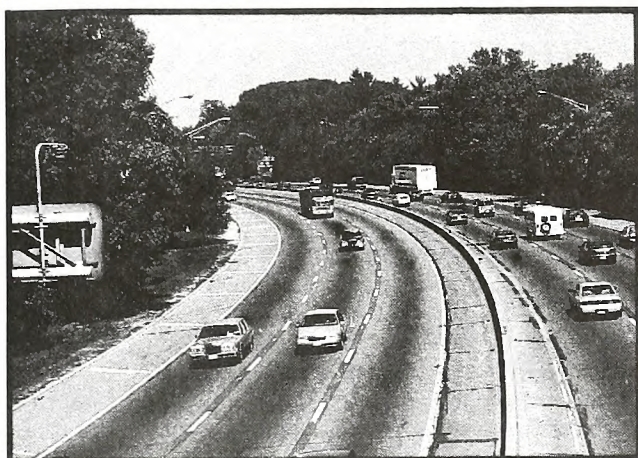
locations. Operations within the queue are characterized by stop-and-go waves, and they are extremely unstable. Vehicles may progress at reasonable speeds for several hundred feet or more, then be required to stop in a cyclic fashion. Level of Service F is used to describe the operating conditions within the queue, as well as the point of breakdown. It should be noted, however, that in many cases operating conditions of vehicles or pedestrians discharged from the queue may be quite good.



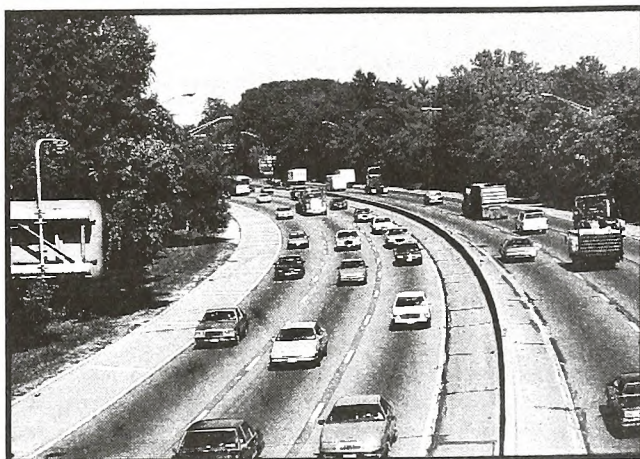
LOS A.



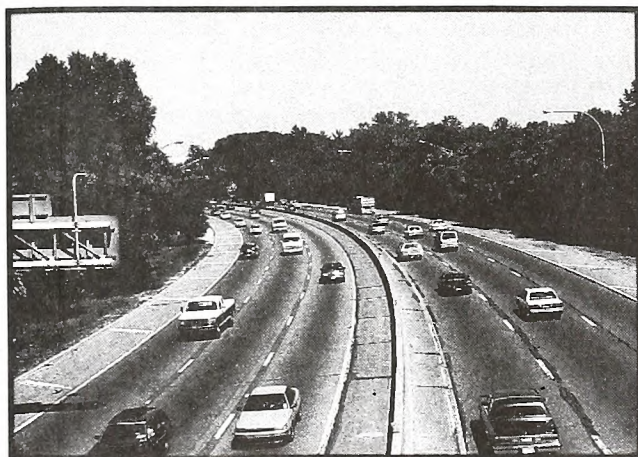
LOS D.



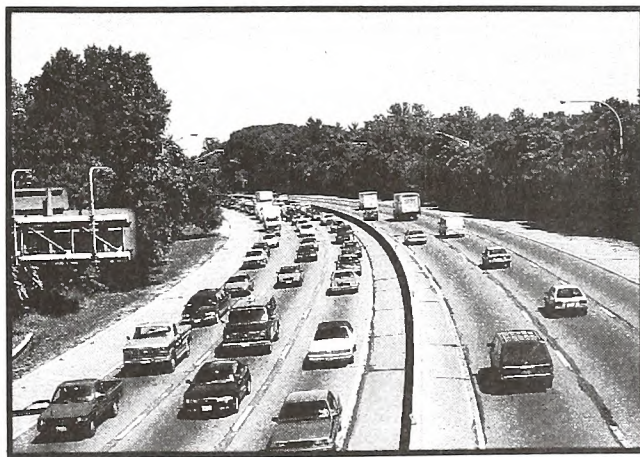
LOS B.



LOS E.



LOS C.

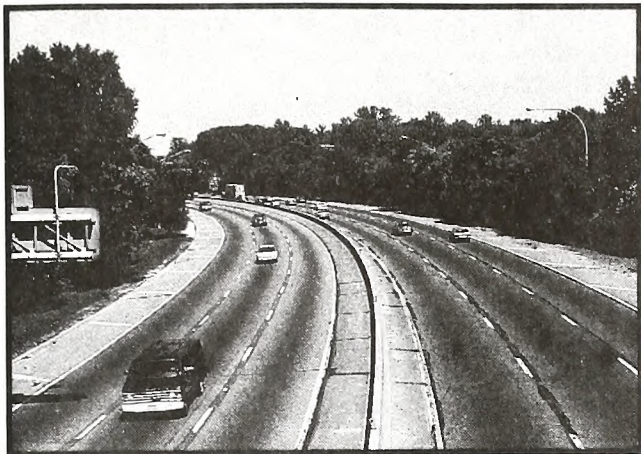


LOS F.

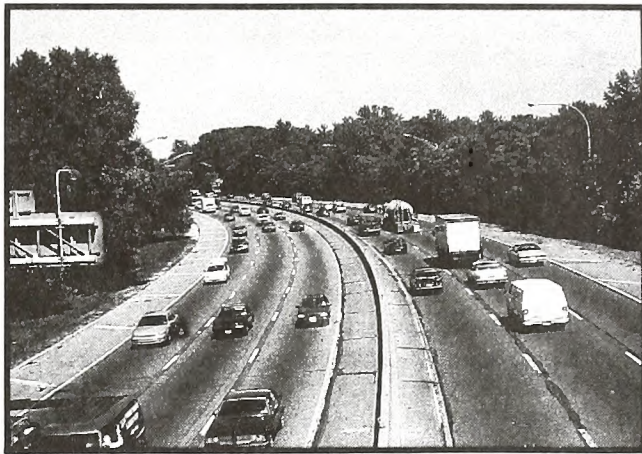
LEVELS OF SERVICE

FIGURE E-1

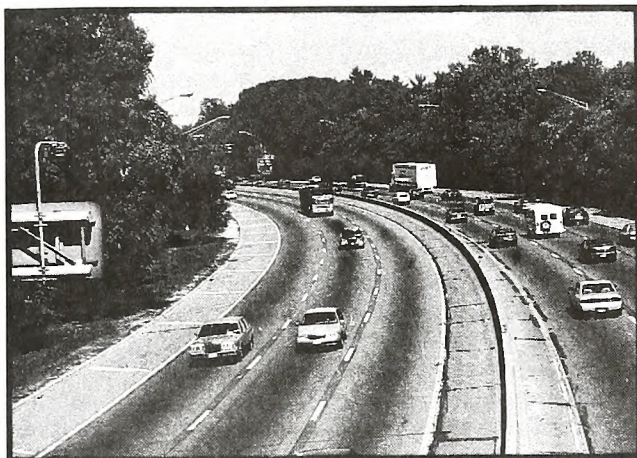




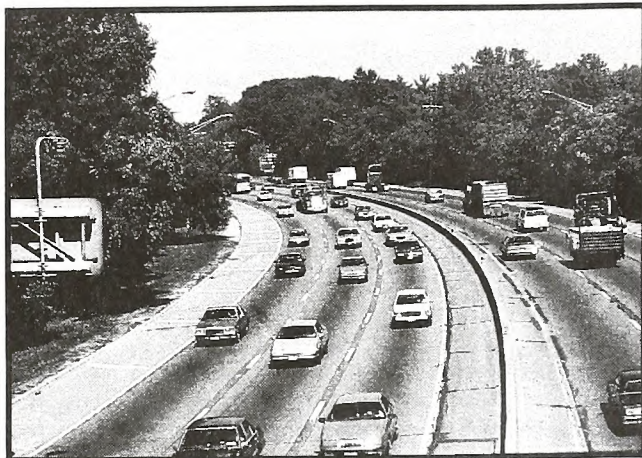
LOS A.



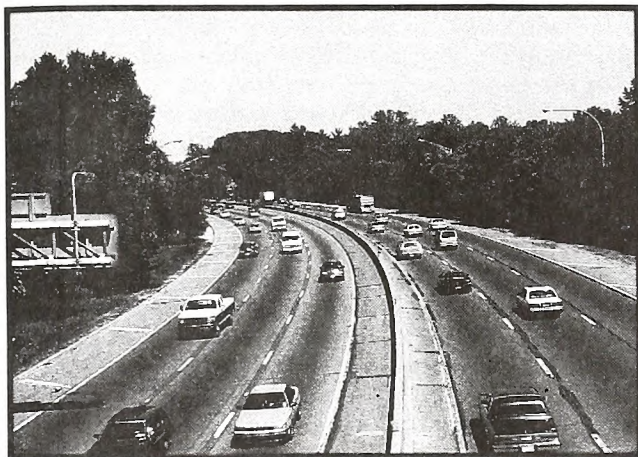
LOS D.



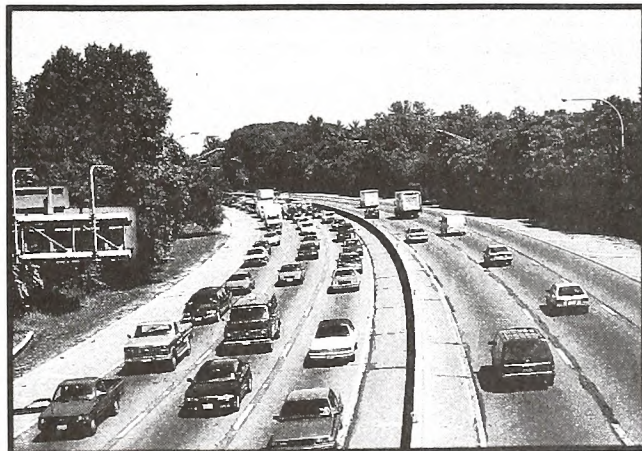
LOS B.



LOS E.



LOS C.



LOS F.

LEVELS OF SERVICE

FIGURE E-1



Appendix F

County and Public Involvement

March 7, 1997:

Meeting with Director of Planning and Development, Teresa Kinney, to discuss initiation of the Surry County Thoroughfare Plan.

April 7, 1997:

Meeting with the Surry County Planning Board to present preliminary information and to receive input from the Board regarding the Surry County Thoroughfare Plan.

April 14, 1997:

Meeting with the Surry County Commissioners to present preliminary information and to receive input from the Board regarding the Surry County Thoroughfare Plan.

May 11, 1998:

Meeting with the Surry County Planning Board to present preliminary recommendations for thoroughfare plan improvements. This meeting was held to get the planning boards comments on identified needs and to seek input on additional recommendation that may not currently be addressed in the plan. Outcome was to recommend the plan to the County Commissioners.

September 21, 1998:

Meeting with the Surry County Commissioners to present preliminary recommendations for thoroughfare plan improvements and to schedule a public drop-in session. During the meeting the recommendations were well received and two other facilities were suggested for review. They were, Jessup Grove Road (SR 1812) and Cook School Road (SR 1815).

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